Gov. Doc. Canada. Agriculture, Department of. Experimental Farms
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APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR		WM. SAUNDERS, C.M.G., LL.D.
DOMINION AGRICULTURIST		J. H. GRISDALE, B. AGR.
" HORTICULTURIST		W. T. MACOUN
" CEREALIST		C. E. SAUNDERS, PH.D.
" CHEMIST		FRANK T. SHUTT, M.A.
" ENTOMOLOGIST		C. GORDON HEWITT, D.Sc.
" BOTANIST		H. T. GÜSSOW
POULTRY MANAGER		A. G. GILBERT
SUPT. EXPERIMENTAL FARM,	NAPPAN, N.S.	R. ROBERTSON
" " "	CHARLOTTETOWN, P.E.I.	J. A. CLARK, B.S.A.
" " "	BRANDON, MAN.	JAMES MURRAY, B.S.A.
" " "	INDIAN HEAD, SASK.	ANGUS MACKAY
" " "	ROSTHERN, SASK.	WM. A. MUNRO, B.A., B.S.A.
" " "	LETHBRIDGE, ALTA.	W. H. FAIRFIELD, M.S.
" " "	LACOMBE, ALTA.	G. H. HUTTON, B.S.A.
" " "	AGASSIZ, B.C.	THOS. A. SHARPE

FOR THE

YEAR ENDING MARCH 31

1909/1910 - 1910/11

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1910.

SIR,—I beg to submit for your approval the twenty-third annual report of the work done and in progress at the several Experimental Farms.

In addition to my own report, you will find appended, reports from the following Dominion officers of the Central Experimental Farm:—From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Cerealist, Dr. C. E. Saunders; from the Chemist, Mr. Frank T. Shutt; from the Entomologist, Dr. C. Gordon Hewitt; from the Botanist, Mr. H. T. Güssow; and also from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. J. A. Clark, Superintendent of the Experimental Farm for Prince Edward Island at Charlottetown; from Mr. James Murray, Superintendent of the Experimental Farm for Manitoba at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for Southern Saskatchewan at Indian Head; from Mr. Wm. A. Munro, Superintendent of the Experimental Farm for Central Saskatchewan at Rosthern; from Mr. W. H. Fairfield, Superintendent of the Experimental Farm for Southern Alberta at Lethbridge; from Mr. G. H. Hutton, Superintendent of the Experimental Farm for Central Alberta at Lacombe, and from Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm for British Columbia at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several Experimental Farms; of scientific research in connection with the breeding of cereals and in determining their relative value; of research

work in the chemical laboratories bearing on many branches of agricultural and horticultural employment; of careful study of the life-histories and habits of injurious and beneficial insects and the best methods to adopt for destroying the most injurious species. In the report of the work of the Entomological Division will also be found particulars of the experiments and observations which have been made during the past year in connection with the apiary. Continued attention has been given to the subject of noxious weeds and the most practical and economical methods by which they may be destroyed; attention has also been given to research into the diseases of plants, the circumstances under which they are propagated and the most effective measures for their subjugation.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the Experimental Farms, the rapidly extending correspondence, and the readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals and other farm crops, furnish gratifying evidence of the desire for information among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower, and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,

Director, Dominion Experimental Farms.

To the Honourable

The Minister of Agriculture,

Ottawa.

ANNUAL REPORT OF THE EXPERIMENTAL FARMS

For the year ending March 31, 1910

REPORT OF THE DIRECTOR

WM. SAUNDERS, C.M.G., LL.D., F.R.S.C., F.L.S.

The season of 1909, although generally late in opening, which delayed seeding, was, during the later growing months, quite favourable, and resulted in most localities in satisfactory crops. Had early sowing been practicable, the average yields would, no doubt, have been larger. In the Census and Statistics Monthly, issued by the Department of Agriculture, from which most of the following figures were obtained, the field crops of the Dominion are given as covering a total area of 30,065,556 acres and as yielding crops which, estimated at average local market prices, would reach the value of $532,992,100, an increase in the total value above that of last year of over $100,-000,000.

In Ontario, the spring weather of 1909, like that of 1908, was unusually wet, and on this account seeding was much delayed. The rainfall of March, April and May was several inches more than the average of many years past. Later in the season, the weather was much more favourable and the resulting crops of grain gave a higher yield per acre than in 1908. The crop of winter wheat is given as 14,086,000 bushels, the average yield being 24·24 bushels per acre. Spring wheat gave an average of 17·45 bushels per acre, the total crop being 2,176,000 bushels. The total crop of oats was 109,192,000 bushels with an average yield of 34·75 bushels per acre. The barley, the total crop of which was 20,952,000 bushels, gave an average of 29·04 bushels per acre. The hay and clover was a somewhat lighter crop than that of 1908, but brought a higher price per ton, so that the return to the Ontario farmer from this crop was about $60,618,000, being nearly 3½ million dollars more than for the crop of 1908.

In Quebec, cold weather prevailed during the months of May and June, but in July and August heat and rain quickened vegetation and, with good harvest weather, a crop was secured considerably above the average of the previous year. Winter wheat is not grown in Quebec; of spring wheat, the total crop was 1,679,000 bushels, with a

yield of 16·71 bushels per acre; of oats, the total crop was 42,501,000 bushels, with an average of 27 bushels per acre, and of barley, 2,604,000 bushels, with an average yield of 24.02 bushels per acre. Of potatoes, the total yield was 30,853,000 bushels, the money value of which was $10,490,000. The hay and clover crop brought the farmers of Quebec $44,440,000.

In the Maritime Provinces, the spring of 1909 opened late, much of the weather in June was dry and cold, but this was followed by excellent growing conditions which brought the grain crops on rapidly, so that the yield in harvest was up to or above the average. Spring wheat yielded heavier crops than in Ontario. In Nova Scotia, the average was 19·80, in New Brunswick 20·15, and in Prince Edward Island 20 bushels per acre. Oats, of which there was a combined yield of 16,334,000 bushels, did not average quite so high per acre as in Ontario. Barley also fell short of the Ontario average. The crop of potatoes brought the farmers of the Maritime Provinces $9,703,000, while the hay and clover crop brought in about $25,000,000.

In Manitoba, the spring weather was unusually cold with frosty nights, which delayed seeding for two or three weeks beyond the usual period. In June and July the weather was very favourable for growth and the yields of all kinds of grain were well up to the average, wheat being generally above that point. The total wheat crop in Manitoba was 52,706,000 bushels, with an average yield of 18·77 bushels per acre. This, it is estimated, brought nearly forty-six million dollars; the oat crop also brought over seventeen millions and the barley crop about eight million dollars.

In Saskatchewan, the spring season opened fairly early and seeding was very general from April 15 to 25. Under the influence of favourable showers and genial heat, grain made a rapid growth. The somewhat heavy rains of the first half of August caused a rank growth of straw which, in some places, was followed by rust with some shrunken grain and a lessening of the yield. No severe frosts occurred until late in September when nearly all the grain was cut. The total yield of wheat in this province was extraordinary, amounting to 85,197,000 bushels, with an average of 23·13 bushels per acre. This, it is estimated, gave a return to that province of over sixty-eight million dollars. The total yield of wheat showed an increase over that of 1908 of more than fifty million bushels. The total crop of oats was 91,796,000 bushels, which gave the unusually high average of 49·70 bushels per acre. The total value of this crop is placed at over twenty-three million dollars. The crops of barley and flax united gave nearly four million dollars, and potatoes, which produced an average of 235 bushels per acre, still another one and one-half million dollars.

In Alberta, the crop of winter wheat, which lies mostly south of the main line of the Canadian Pacific railway, amounted to 2,009,000 bushels, with an average yield of 24·80 bushels per acre. The spring opened early, which admitted of earlier seeding than usual. Spring wheat gave a total crop of 7,570,000 bushels, with an average yield of 24·90 bushels per acre. The oats in that province gave a total crop of 38,376,000 bushels, with an average production of 46·80 bushels per acre. The barley crop was much smaller, the total being 5,999,000 bushels, giving an average of 32·25 bushels per acre. The total value of the crops of spring grain in Alberta was about 18½ million dollars. Potatoes gave a crop of 2,599,400 bushels, which returned to the farmers of Alberta over a million dollars.

In British Columbia, no statistics are available outside of the regular census, taken every ten years. The spring of 1909 was cold and somewhat late, but subsequent warm weather made the season on the whole a favourable one. At the Experimental Farm at Agassiz, the twelve varieties of spring wheat under test gave an average of 22 bushels 31 lbs. per acre. Twenty-two varieties of oats gave an average of 79 bushels 28 lbs. per acre and twenty varieties of barley an average of 46 bushels 20 lbs. per acre. The average of fifteen varieties of peas was 41 bushels 16 lbs. per acre and that of twelve varieties of turnips 40 tons 115 lbs. per acre.

CO-OPERATIVE EXPERIMENTS BY FARMERS THROUGHOUT CANADA.

Another distribution was made this year from the Experimental Farms to Canadian farmers of samples of seed of high quality for the improvement of crops. The object in view in this distribution was to ascertain by test the relative merits of the different sorts under trial, as to quality, productiveness and earliness in ripening. In conducting these trial plots, farmers everywhere have readily undertaken to co-operate with the Experimental Farms and to report the results of their experiments. These joint efforts have been productive of much good, and a great deal of information has thus been gathered as to the suitability of these different varieties to the climatic conditions prevailing in different parts of Canada.

During the season of 1909 the number of Canadian farmers who have united in these experiments was 50,396. The value of this work in all parts of the Dominion has been abundantly demonstrated.

The samples sent from the Central Farm have weighed as follows: Wheat and barley, five pounds each, and oats, four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, peas and potatoes have weighed three pounds each.

DISTRIBUTION OF SAMPLES BY PROVINCES.

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Oats	383	1,176	1,367	5,345	2,314	614	1,135	847	108
Barley	81	457	200	1,802	586	234	427	339	42
Wheat	167	647	528	2,813	587	778	2,331	1,009	32
Peas	20	275	151	788	318	172	357	310	59
Indian Corn	21	131	107	512	478	53	58	35	40
Potatoes	51	833	312	4,115	3,513	1,094	3,020	1,338	541
Total	723	3,519	2,665	15,375	7,796	2,945	7,328	3,878	822

Total number of samples distributed, 45,051.

Total number of packages of each sort distributed:—

Oats	13,289
Barley	4,168
Wheat	8,892
Peas	2,450
Indian Corn	1,435
Potatoes	14,817
Total	45,051

The following list shows the number of packages of the different varieties which have been sent from the Central Experimental Farm:—

Name of Variety.	Number of Packages.
OATS.	
Banner	6,920
Danish Island	1,494
Wide Awake	1,325
White Giant	1,204
Improved Ligowo	1,111
Thousand Dollar	747
Daubeney	488
Total	13,289
BARLEY (SIX-ROW.)	
Mensury	2,188
Odessa	377
Mansfield	300
Claude	196
(TWO-ROW.)	
Invincible	397
Canadian Thorpe	375
Standwell	299
Sidney	36
Total	4,168
SPRING WHEAT.	
Red Fife	4,024
Preston	1,759
White Fife	716
Pringle's Champlain	457
Marquis	407
Stanley	381
Percy	331
Huron	321
Chelsea	317
Bobs	179
Total	8,892

Name of Variety.	Number of Packages.
PEAS.	
Golden Vine	1,757
Arthur	693
Total	2,450
INDIAN CORN.	
Longfellow	410
Angel of Midnight	281
Selected Leaming	270
Compton's Early	264
North Dakota White	70
Early Mastodon	64
White Cap Yellow Dent	63
Champion White Pearl	13
Total	1,435
POTATOES.	
Rochester Rose	3,406
Money Maker	2,094
Gold Coin	1,847
Irish Cobbler	1,505
Carman No. 1	1,433
Queen of Hebron	1,271
Dooley	885
Early Manistee	508
Banner	395
Empire State	362
American Wonder	293
Late Puritan	246
Burpee's Extra Early	189
Ashleaf Kidney	168
Twentieth Century	140
White Seedling	75
Total	14,817

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the Branch Experimental Farms as follows:—

Experimental Farm, Nappan, N.S.—

Spring Wheat	80
Oats	350
Barley	57
Buckwheat	25
Potatoes	252
	730

Experimental Farm Brandon, Man.—

Wheat	51
Oats	48
Barley	22
Peas	17
Potatoes	252
	390

Experimental Farm, Indian Head, Sask.—

Spring Wheat	206
Oats	155
Barley	52
Peas	60
Sundries (flax, rye)	14
Potatoes	500
	987

Experimental Farm, Lacombe, Alta.—

Winter Wheat	167
Spring Wheat	264
Oats	219
Barley	110
Potatoes	541
	1,315

Experimental Farm, Lethbridge, Alta.—		*Experimental Farm, Agassiz, B.C.—*	
Winter Wheat	167	Spring Wheat	17
Spring Wheat	299	Oats	241
Barley	95	Barley	29
Oats	170	Peas	47
Potatoes	568	Potatoes	290
	1,299		624

By adding the number of farmers supplied by the branch Farms to those supplied by the Central Farm, we have a total of 50,396. The average number of samples sent out each year for the past eleven years has been over 38,000.

It is remarkable how rapidly a supply of grain may be built up from a single four or five-pound sample. Take, for instance, a sample of oats. The four pounds received will, if well cared for, usually produce from three to four bushels. This, sown on two acres of land, will, at a very moderate estimate, give one hundred bushels, and sometimes much more, but taking the lower figure as the basis for this calculation, the crop at the end of the second year would be sufficient to sow fifty acres, which, at the same moderate comparison, would furnish 2,500 bushels available for seed or sale at the end of the third year.

The critical point of these tests is the threshing of the grain at the end of the first season, and it is here that some farmers fail to get the full advantage of the experiment. The product of the one-twentieth acre plot is sometimes threshed in a large machine, which it is difficult to thoroughly clean, and in this way the grain becomes mixed with other varieties and with weed seeds and is practically ruined. At the Central Experimental Farm we thresh the produce of many of the small plots of grain by cutting off the heads, placing them in sacks and beating them with a stick, then winnowing until most of the chaff is got rid of, and the grain made clean enough for sowing.

Where the farmer is to use this seed for his own sowing it is not necessary that the sample be entirely free from chaff. It is, however, most essential, if he is to get the full benefit of his experiment, that the grain be quite free from all admixture with other sorts of grain or with weeds. Farmers are expected to harvest the product of their experimental plot separately, and store it away carefully, threshing it by hand either with a flail or in such other manner as they may prefer. The results to be gained will abundantly repay the cost of careful handling of the grain.

Every season after the regular free distribution of the samples has been provided for, the surplus grain grown on the Experimental Farms not required for sowing is sold to farmers in quantities of from 2 to 6 bushels or more each. In this way, a considerable number of farmers are supplied every year with seed grain in these larger quantities, especially from the branch Farms at Brandon, Manitoba; Indian Head, Saskatchewan; and at Lethbridge, Alberta.

ADDITIONS TO THE STAFF OF THE EXPERIMENTAL FARMS.

Following the death of our esteemed coadjutor, Dr. Jas. Fletcher, it was thought best by the Hon. Minister to reorganize the Division of Entomology and Botany which had been under Dr. Fletcher's charge, and to arrange for two separate Divisions, one of Entomology and one of Botany.

The position of Entomologist was given to Dr. C. Gordon Hewitt and that of Botanist to Mr. H. T. Güssow.

Dr. Charles Gordon Hewitt was educated at the Macclesfield Grammar School and the University of Manchester, England, where he obtained zoology, botany and Dalton natural history prizes; he graduated in 1905 as bachelor of science, with first-class honours in zoology, and was awarded a university graduate scholarship. He was appointed the same year as assistant lecturer and demonstrator in zoology in the Manchester University, and, two years later, was appointed to the newly-instituted lectureship in economic zoology, which he resigned on accepting the post of entomolo-

gist to the Dominion. The degree of Master of Science was conferred in 1907 for research and the degree of Doctor of Science was conferred in 1909, for his researches in economic zoology, especially entomology. Dr. Hewitt has made a special study of insects, and has also studied at various fresh water and marine biological stations and has made a special investigation of those animals and parasites which affect agriculture, horticulture and forestry.

His chief work has been upon the house fly, especially in its relation to public health and the results of his investigations, extending over a number of years, are comprised in a detailed monograph, beautifully illustrated, published in the Quarterly Journal of Microscopical Science, 1907-1909. In this connection, he has assisted in an inquiry of the British local government board on the carriage of infection by flies. He has also investigated the life-histories, &c., of other injurious insects.

He is a Fellow of the Entomological Society, joint honorary secretary of the Association of Economic Biologists, and of the Manchester Literary and Philosophical Society, and a foreign member of the American Association of Economic Entomologists.

Mr. Hans T. Güssow is a native of Breslau, Silesia. He received his scientific training at the German universities of Breslau, Leipsic and Berlin, specializing in applied botany and subsequently in plant diseases caused by microscopic fungi and bacteria. He proceeded to England in 1901, and, in 1903, entered the botanical laboratory of Dr. William Carruthers, F.R.S., the eminent British botanist, who for thirty-seven years has occupied the position of consulting botanist to the Royal Agricultural Society of England, and who was formerly in the natural history department of the British Museum. In the capacity of assistant to Dr. Carruthers, Mr. Güssow has necessarily been brought into contact with British agriculturists and has studied carefully the botanical problems with which land owners and practical farmers are called upon to deal, including such subjects as the destruction of larch forests by the larch disease, clover-sick land, potato diseases, and the effects of poisonous and of injurious weeds. In this connection, he has done a good deal of original research. He was also an active member of the scientific committee of the Royal Horticultural Society. He is a Fellow of the Royal Microscopical Society and has served upon its sectional committee for medical bacteriology and histology. He is also a member of the Association of Economic Biologists, of the Association of Economic Botany, of the Société Mycologique de France and of other learned bodies. His scientific articles are artistically illustrated with reproductions from his own drawings and photographs.

Both of these Divisions of the work of the Experimental Farms have been well equipped with apparatus and books and the officers have entered on their work with energy and thoroughness. The excellent work done by these gentlemen in the past leads us to anticipate a brilliant future for these two Divisions of the Farm work.

BULLETINS AND PAMPHLETS ISSUED DURING THE YEAR ENDING MARCH 31, 1909.

Four new bulletins were issued during the year and a second edition of Bulletin No. 51, Bacon Pigs in Canada, the first edition of which was exhausted.

The new bulletins issued were the following:—

Bulletin 62, of the Experimental Farm Series, by W. T. Macoun, Dominion Horticulturist, on Strawberry Culture. This contains a short history of the improvement of the strawberry, and its methods of propagation, preparation of the soil, treatment of plants, cultivation and winter protection are fully dealt with. Lists of varieties notable for such characteristics as earliness, firmness of fruit, large size, attractiveness and hardiness are given, as well as a very complete description of the varieties which have been tested at the Central Experimental Farm.

Bulletin 63, A Serious Potato Disease occurring in Newfoundland, by H. T. Güssow, Dominion Botanist, was issued to call the attention of the Canadian potato-growers to a disease called Potato-canker which had appeared in Newfoundland. This

disease, which is quite widely spread in Europe, is fully described and its history given. Methods of prevention and of dealing with it where present are prescribed.

Bulletin No. 64 of the Experimental Farm series was prepared jointly by the Cerealist, Dr. C. E. Saunders, and myself. This treats of the results obtained on all the Dominion Experimental Farms from trial plots of grain, fodder corn, field roots and potatoes, in 1909. This is the fifteenth issue of this special publication. There are presented in this bulletin the results of a large number of experiments which have been conducted at all the Dominion Experimental Farms during the season of 1909 with spring and winter wheat, oats, barley, peas, Indian corn, turnips, mangels, carrots, sugar beets and potatoes. The average results are also given for the past five years of the comparative tests of those varieties which have been long under trial, and these records are arranged in the order of their yield.

These trial plots are conducted with the object of gaining information as to the relative productiveness of the different sorts and their earliness in ripening in the different climates of Canada. The returns show much variation in the weight and earliness of the crops grown, and point to the importance of care in the choice of varieties of seed for sowing.

Bulletin 65, on Growing and using Corn for Ensilage, by J. H. Grisdale, B. Agr., Dominion Agriculturist, indicates the value of corn ensilage as a fodder plant. Suitable varieties of corn are given for the different climates of Canada and methods of cultivating, harvesting and ensiloing described. Rations, including ensilage, are worked out and the cost of growing and harvesting this crop is stated. Illustrations are furnished of the machines and processes involved in growing this crop.

Two pamphlets were also issued during the year, No. 7 by W. T. Macoun, Dominion Horticulturist, on Ginseng and Melon Culture, and Poultry Circular No. 6 by the Poultry Division, giving a plan of a cotton-front poultry house.

CORRESPONDENCE.

The correspondence carried on during 1909-10 between the farmers of Canada and the officers of the Experimental Farms has been very large.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters and reports sent out at the Central Experimental Farm from April 1, 1909, to March 31, 1910:—

	Letters received.	Letters sent.
Director..	60,519	22,813
Agriculturist..	3,551	6,016
Horticulturist..	2,602	2,487
Chemist..	2,104	1,929
Entomologist..	1,267	1,683
Botanist..	518	725
Cerealist..	491	425
Poultry Manager..	4,834	5,773
Accountant..	1,398	2,697
	77,284	44,548

Many of the letters received by the Director are applications for samples of seed grain or for the publications issued by the Experimental Farms; many of these are answered by mailing the material asked for, accompanied in most instances by circular letters. This will explain why the number of letters received by that officer so much exceeds the number sent out.

DISTRIBUTION OF REPORTS, BULLETINS AND CIRCULAR LETTERS.

Reports and bulletins mailed..	305,150
Circulars and letters relating to samples of seed grain..	41,241
	346,391

BRANCH EXPERIMENTAL FARMS.

The correspondence conducted by the Superintendents of the Branch Experimental Farms is also large, as is shown by the following figures:—

		Letters received.	Letters sent.
Experimental Farm,	Nappan, N.S.	2,301	2,011
" "	Charlottetown, P.E.I.	160	122
" "	Brandon, Man.	3,006	2,864
" "	Indian Head, Sask	6,963	6,908
" "	Rosthern, Sask.	350	308
" "	Lethbridge, Alta.	3,748	3,518
" "	Lacombe, Alta.	4,248	3,571
" "	Agassiz, B.C.	4,751	4,506
		25,527	23,808

Much additional information has also been sent out from the Branch Farms by printed circulars. By adding the correspondence conducted at the Branch Farms to that of the Central Farm, the total number of letters received is found to be 102,651 and of those sent out, 68,134.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The following report includes tests of grain and other seeds grown on the several Experimental Farms, as well as those bought with the object of growing them on the Farms. The list also includes tests of the vitality of a number of specimens of grain grown in the several provinces of the Dominion, from the samples distributed from the Central Experimental Farm. These tests have been made with the object of ascertaining what climatic conditions are most favourable for producing seed of high vitality, and how far this desirable quality is likely to be influenced by variations in character of season. Formerly these tests included a number of doubtful samples which were believed, by the parties sending them, to have been injured in their vitality by exposure to unfavourable conditions. All such samples are now referred to the Seed Commissioner for report. The results reported on here are the average proportions of vitality shown by samples of grain grown in different parts of the several provinces of Canada, under healthy and normal circumstances. In the following table, showing the results by provinces, the total percentage of vitality is given, also the percentage of strong and weak growth.

RESULTS of Tests of Seeds for Vitality, 1909-10.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	438	100·0	36·0	86·9	3·0	89·9
Barley	328	100·0	52·0	85·5	5·8	91·4
Oats	402	100·0	39·0	85·6	4·1	89·7
Rye	8	95·0	64·0	80·5	3·3	83·8
Peas	139	100·0	42·0	....	....	87·8
Corn	28	100 0	16·0	....	....	81·8
Flax	19	97·0	42·0	....	....	79·6
Carrots	11	64·0	25·0	....	....	45·5
Beans	5	100·0	86·0	....	....	95·6
Grass	2	88·0	86 0	....	....	87 0
Clover	3	91·0	61·0	....	....	77·0
Cabbage	1	....	....	....	....	88·0
Radish	1	....	....	....	....	78·0
Total number of samples tested, highest and lowest percentage	1,385	100·0	16·0	....	....	....

TABLE showing Results of Grain Tests for each Province for 1909-10.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	79	100·0	41·0	84·9	4·3	89·3
Barley	62	100·0	54·0	82·6	7·0	89·6
Oats	70	100·0	80·0	92·2	2·4	94·6
QUEBEC.						
Wheat	38	100·0	70·0	90·1	2·3	92·4
Barley	38	100·0	89·0	89·2	5·0	94·3
Oats	27	100·0	78·0	89·7	3·2	93·0
MANITOBA.						
Wheat	51	100·0	72·0	88·0	2·7	90·7
Barley	38	99·0	81·0	87·9	5·7	93·6
Oats	41	100·0	57·0	88·6	3·9	92·6
SASKATCHEWAN.						
Wheat	87	100·0	36·0	86·8	3·3	90·1
Barley	45	100·0	80·0	86·0	7·2	93·2
Oats	56	100·0	52·0	83·3	4·2	87·5
ALBERTA.						
Wheat	76	100·0	61·0	87·7	2·7	90·5
Barley	65	100·0	52·0	87·0	4·1	91·1
Oats	85	100·0	39·0	72·8	7·9	80·7
NOVA SCOTIA.						
Wheat	54	100·0	44·0	80·3	2·9	83·3
Barley	50	100·0	72·0	83.7	6·4	90·1
Oats	47	100.0	78·0	89·6	2·5	92·2
NEW BRUNSWICK.						
Wheat	18	100·0	64·0	89·8	1·3	91·2
Barley	4	96·0	83·0	78·2	11·5	89·7
Oats	26	100·0	81·0	90·0	2·7	92·7
PRINCE EDWARD ISLAND.						
Wheat	22	100·0	84.0	92·5	2·5	95·1
Barley	4	95·0	68·0	84·5	3·0	87·5
Oats	24	100·0	89·0	93·8	1·7	95·6
BRITISH COLUMBIA.						
Wheat	13	100·0	92·0	94·5	1·1	95·6
Barley	22	99·0	61·0	84·2	4·7	88·9
Oats	26	100·0	66·0	86·9	3·5	90·4

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE of meteorological observations taken at the Central Experimental Farm, Ottawa, from April 1, 1909, to March 31, 1910, giving maximum, minimum and mean temperature for each month, with date of occurrence; also rainfall, snowfall and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°							
April ...	46·01	28·96	17·04	37·46	64·0	13th	14·5	10th	2·96	7·50	3·71	16	0·83	19th
May	63·15	44·04	19·10	53·59	75·5	14th	30·5	4th	5·84	s	5·84	22	1·34	1st
June....	77·91	53·45	24·46	65·68	91·8	22nd	39·9	18th	2·52	.....	2·52	9	0·83	14th
July	77·36	56·97	20·38	67·16	89·8	15th	47·0	9th	4·69	......	4·69	17	1·09	18th
Aug	80·16	55·80	24·35	67·97	95·6	25th	42·0	22nd	3·11	......	3·11	11	1·25	16th
Sept	67·84	47·85	19·99	57·84	84·8	14th	36·6	29th	2·81	.. .	2·81	15	0·59	4th
Oct......	53·70	36·79	16·90	45·24	76·8	10th	21·8	30th	1·11	s	1·11	10	0·35	15th
Nov.....	42·86	28·42	14·44	35·64	63·6	12th	6·0	24th	2·93	2·50	3·18	13	1·10	23rd
Dec. ...	24·31	13·47	10·84	18·89	36·0	8th	— 8·8	29th	......	15·00	1·50	10	0·65	14th
Jan.....	25·87	9·94	15·92	17·90	41·0	22nd	—18·5	5th	1·36	9·50	2·30	16	0 70	22nd
Feb.....	22·45	3·32	19·13	12·88	43·4	28th	—19·4	7th	0·08	22·25	2·30	12	0 70	12th
Mar. ...	42·64	24·55	18·08	33·59	72·6	28th	— 3·3	18th	0·99	4·50	1·44	11	0·44	7th
									28·40	61·25	34·51	162		

Rain or snow fell on 162 days during the 12 months.
Heaviest rainfall in 24 hours, 1·34 inches on May 1st.
Heaviest snowfall in 24 hours, 7·00 inches on February 12th.
The highest temperature during the 12 months was 95·6° on August 25th.
The lowest temperature during the 12 months was −19·4° on February 7th.
During the growing season, rain fell on 16 days in April, 22 days in May, 9 days in June, 17 days in July, 11 days in August, and 15 days in September.
June shows the lowest numbers of days with precipitation, viz.: 9.
Total precipitation during the 12 months 34·51 inches, as compared with 32·91 inches during 1908-09.

RAINFALL, snowfall and total precipitation from 1890 to 1909-10, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
1890	24·73	64.85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71 50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·72
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
1905	23·71	87·25	32.42
1906, January 1 to March 31	1·90	24·50	4·34
1906-07	21·73	72·50	28·94
1907-08	24·70	134·75	38·18
1908-09	22·13	107·90	32·91
1909-10	28·40	61·25	35·51
Total for 20 years and 3 months	524·45	1,842·00	708·96
Average for 20 years	26·22	92·10	35·44

RECORD of sunshine at the Central Experimental Farm, Ottawa, from April 1, 1909, to March 31, 1910.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	23	7	172·7	5·75
May	27	4	195·5	6.30
June	29	1	255·0	8·50
July	29	2	236·9	7·64
August	30	1	279·7	9·02
September	29	1	190·6	6·35
October	28	3	134·8	4·34
November	26	4	87·9	2 93
December	18	13	59·4	1·91
January	22	9	88·8	2·86
February	23	5	124·1	4·43
March	28	3	214·8	6·92

(Signed) WILLIAM T. ELLIS,
Observer.

MEETING OF THE BRITISH ASSOCIATION.

Early in the summer of 1909, I was invited by the British Association for the Advancement of Science to prepare, for the meeting of the Association to be held in Winnipeg during the last week in August, a paper on the Development of the Dominion Experimental Farms. This was duly presented on August 27 as follows:—

DEVELOPMENT OF THE DOMINION EXPERIMENTAL FARMS.

By Dr. WM. SAUNDERS, C.M.G.,

Director, Dominion Experimental Farms.

At the meeting of the British Association held at Bradford, Yorkshire, in 1900, it was my privilege to bring before the Association some of the results of the experimental work in agriculture conducted in Canada under the Dominion Government in connection with the Experimental Farms.

On that occasion, I reviewed briefly the depressed condition of agriculture which prevailed in Canada prior to 1884. In that year, the House of Commons appointed a Select Committee to inquire as to the best means to adopt to encourage and develop the agricultural interests of Canada, in the prosperity of which all classes of the community were deeply concerned. The report of that Committee showed that agriculture, the most important national industry of the country,—one in which more than half the entire population were engaged—was in a lamentable and discouraging condition. The evidence brought forward showed that there was no lack of fertility in the soil and that climatic conditions were favourable for the production of good crops, but that the depression was due to a wide-spread condition of ignorance among the farming community. This lack of information led to defective farming and the adoption of wasteful methods.

At that time no means had been provided to help the farmer in the many difficulties which beset his path. Ill-rewarded and discouraged in his work, he had no one to look to for advice and assistance. Thus agriculture made little or no progress.

The Parliamentary Committee recommended the establishment of Experimental Farms, where tests should be carried on in all branches of agriculture and of horticulture, and that the results of this work should be published from time to time and disseminated freely among the farmers of the Dominion. Action on this report was soon taken and, during the session of Parliament for 1886, an Act was introduced and passed almost unanimously, authorizing the Dominion government to establish a Central Experimental Farm and four Branch Farms. The Central Farm was located near Ottawa, Ontario; the Branch Farm for the Maritime Provinces at Nappan, Nova Scotia; that for Manitoba at Brandon; the Farm for the Northwest Territories at Indian Head; and that for British Columbia at Agassiz.

This work, as set forth in the Act under which the Farms were established, covered all the more important branches of agriculture, horticulture and arboriculture. It has been carried on most actively and efficiently by a competent staff and was arranged so as to cover first those subjects on which farmers were in the greatest need of information. Investigation and experimental research work have been carried on along all the more important lines and a great mass of facts accumulated, many of which have been given to the farmers of this country from time to time, in the reports and bulletins which have been distributed.

Among all the forms of employment which engage man's attention, there are few which require more ability to conduct successfully than farming. Competition in food products is keen throughout the civilized world and farmers everywhere must turn to practical account every advantage within their reach affecting the quality and cost of their productions, if they are to improve their condition.

Twenty-two years have now passed since this work was inaugurated and, during that time, agriculture has made great advancement. The progress referred to has brought about a wonderful improvement in the condition of the farming population and an enormous increase in the exports of agricultural products.

The Experimental Farms have become bureaus of information, to which farmers in all parts of the Dominion apply for advice and direction in times of difficulty, when confronted with problems which they are unable to solve. Nine years ago, the number of letters received per annum at all the Experimental Farms was 69,669. By the year ended March 31, 1909, the number had increased to over 100,000. There has also been an increase during the same period of nearly 100,000 in the number of reports and bulletins distributed. There is thus a constant stream of information going out to Canadian farmers, much of it in response to direct personal application.

Nine years ago, when this subject was first brought before the British Association, the work had grown very much, and during the period which has since elapsed it has been still further extended, especially in the Canadian Northwest. When the two western provinces of Saskatchewan and Alberta were carved out of what had been known hitherto as the Northwest Territories, Saskatchewan was given a land area of 242,332 square miles (nearly 161,000,000 acres,) and a water area of 8,318 square miles. To Alberta was given a land area of 251,180 square miles (about 155,000,000 acres), with a water area of 2,360 square miles, each province extending from the 49th to the 60th parallel of latitude, a distance of 760 miles. The area of these two provinces is said to be as large as the united areas of Great Britain, France and Germany.

The only Experimental Farm then in operation to serve this vast territory was that at Indian Head, in the southern part of Saskatchewan. Since then, another Branch Farm has been put in operation at Rosthern, in Northern Saskatchewan, 200 miles north of the Canadian Pacific railway and 50 miles south of Prince Albert. Two Branch Farms have also been established in Alberta, one for Southern Alberta at Lethbridge, on the Crow's Nest line of railway, 108 miles from Medicine Hat, and one for Central Alberta at Lacombe, 80 miles south of Edmonton, while the northern part of the country is served by a small Branch Station on the farm of one of the older settlers at Fort Vermilion, on the Peace River, about 400 miles directly north of Edmonton, or 700 miles distant from that city by the regular mail route.

Farther west, the Branch Farm at Agassiz has been doing good work for the past twenty-two years, and recently a suitable site has been chosen in British Columbia for carrying on experiments in what is known as 'dry-farming.' This new station is in the vicinity of Kamloops, where ten acres of land are being devoted to experiments with the more important farm crops.

Negotiations are in progress for a Branch Farm on Vancouver Island, B.C. It is also expected that another will be located within the dry interior district of British Columbia, probably in one of the larger fruit-growing areas.

At the other extremity of the Dominion, in Prince Edward Island, a Branch Experimental Farm, containing about 65 acres, has recently been established near the city of Charlottetown and this is now being prepared for experimental work in the spring of 1910.

The five original Experimental Farms have thus been increased to nine, with three additional smaller stations. Two of the latter have already been referred to; the third is near Lake Abitibi in Quebec, near the line of the Grand Trunk Pacific railway, a short distance from the boundary line between that province and Ontario. It will thus be seen that the number of stations for carrying on experimental work has more than doubled within the past five years and it is probable that further extension in this direction will be made before long.

Permit me to refer briefly to the special lines of work which have been carried on at the Central Farm from the beginning, and to refer later to each branch farm and experiment station, noting some of the special courses of experiments which have been, or will be, conducted at each.

At all the Farms, experiments are conducted each year on what are known as uniform trial plots, where a number of varieties of the more important farm crops are tested to ascertain their relative productiveness, quality and earliness in maturing. This list includes varieties of spring wheat, oats, barley, peas, Indian corn, turnips, mangels, sugar beets and potatoes. The merits of each of the different sorts on this list are carefully inquired into every year and the crops produced in the different climates of the Dominion compared. Any of those varieties which show any serious defects are discarded and the list thus reduced, unless there are any new sorts available of sufficient promise to warrant their being placed in this special group.

In some products, frequent changes are made in this list, on account of the many new varieties obtainable. Take, for example, wheat, which is the leading crop in the Dominion.

The Dominion Cerealist is continually producing, by cross-breeding and selection, a large number of new sorts. He thoroughly tests each one before it is admitted into the special list. Its quality must be excellent, its earliness undoubted and its productiveness satisfactory. The tests, to which all are subjected, include the grinding of the wheat into flour and the baking from it of bread. These experiments are many times repeated. Chemical analyses of the flour are also made in the Chemical Division. If a wheat after many trials maintains a good reputation, it is continued in the trial plots and grown also in larger plots for more general distribution. The new sorts are thus grown alongside of a few of the very best of the older ones, where the relative merits of each may be ascertained and any weak points discovered.

Similar experiments are carried on with oats, where earliness of ripening, productiveness, thinness of hull, stiffness of straw and rust-resisting power are all points of excellence which are diligently sought for, and as many of these good qualities as possible must be combined in a variety before a place can be given it on the select list. The total production of oats in Canada, in 1908, was 250,377,000 bushels. This, when compared with the total wheat production during the same year, of 112,444,000 bushels, shows the relative importance of oats in our great agricultural undertakings. This grain, being rich in nutritive qualities, is most important to all farmers, forming the chief grain food for horses and being also an important ingredient in the food used

for fattening cattle and swine. The Dominion Cerealist has also produced many excellent varieties of barley and new strains of oats, peas, flax, beans, &c. The field of work covered by him is a very large one and includes much of the labour of preparing and supplying material for the uniform trial plots conducted at all the experimental farms.

The Dominion Agriculturist's Division covers the care of cattle, horses, swine and sheep. He breeds and selects animals with special qualifications for particular purposes, adding from time to time individuals of great excellence to the several herds and thus replacing less valuable specimens. Many good animals are also sent to the Branch Farms. In the four classes of dairy animals kept at the Central Farm at Ottawa, a faithful record is kept of the quantity of milk produced by each animal and the proportion of butter-fat it contains. By this method, unprofitable animals are promptly detected and eliminated, thus increasing the average productiveness of the whole herd. During the past ten years, the milk production of the dairy herd at Ottawa has been increased from an average of about 4,000 lbs. to nearly 8,000 lbs. per annum. Farmers everywhere have been encouraged to keep records of the milk given by the individual members of their herds and printed forms for taking the daily records of milk production have been supplied free to all those desiring to use them. Some farmers who have used these forms have, by this process of selection, more than doubled the returns from their herds.

The Dominion Agriculturist has also paid much attention to the ventilation and cleanliness of barns and stables, so that pure air and wholesome food may contribute to the successful development of the animals under test. Many feeding trials have been conducted to gain experience in the fattening of cattle, swine and sheep so as to ascertain how the highest quality of beef, pork and mutton may be most economically produced. Extensive experiments have been carried on in the growing of Indian corn or maize, and the making of ensilage from this crop. These improvements have shown the way to profitable fields for further investigation in dairying and cattle feeding, which many of the more intelligent farmers in Canada are profitably following.

Many experiments have also been conducted along other lines, especially with reference to the preparation and treatment of the soil and at the same time emphasizing the importance of a suitable rotation of crops.

The horticultural field has also been well covered and the various lines of experimental work carried on with much industry and success. In the production of new varieties of apples, the Dominion Horticulturist has already made for himself an enviable reputation. Out of many hundred varieties which have been produced by him, there are quite a number which are of high quality and great promise, some of which will, no doubt, shortly find their way into the large orchards of the country and thus become available to the public in the home and foreign markets.

In other fruits, also, both large and small, much good work has been done. In the growing of vegetables as well, many varietal and other tests have been undertaken and much useful information obtained. The lists of the best selections of the different varieties of vegetables given for the guidance of farmers have been very helpful. Several special pamphlets have been prepared on the growing of vegetables, giving particulars of the cultural methods which have been most successful. The Horticultural Division carries on other lines of work, among the more important of which may be mentioned the experiments with potatoes, the spraying of fruits and plants for the subjugation of injurious insects and fungous diseases, the care of the Arboretum and of the forest belt.

The Chemical Division fills an important place in the organization of the Experimental Farms. The analysis of cereals, fodder plants and other important farm crops to determine the proportions of their more important constituents, and when these crops may be harvested to the greatest advantage, has received much attention. Special care has been given to the analysis of soils, both virgin and cultivated, from

various parts of Canada, to ascertain their condition as to fertility, and suggestions have been made as to the best means to adopt for the economic maintenance and increase of their crop-producing power.

Many milling and other by-products sold for feeding stock in Canada have been examined and their relative feeding value determined. Analyses have been made to ascertain the manurial value of certain naturally-occurring fertilizers, such as mucks, tidal deposits, marls, sea-weeds, &c., and instruction given to those who are so situated as to benefit from their use. Much information has also been given regarding the best methods of handling barn-yard manure, so as to prevent waste, also in reference to the ploughing under of green crops so as to add fertility and humus to the land.

The feeding value of many species of native grasses growing on uplands and in sloughs in different parts of the Dominion has been ascertained. The experiments conducted with wheat to find out the influence of environment on its composition, especially with reference to varying conditions of moisture, have been very instructive. The work done on frosted wheat has confirmed the general belief in the value of these lower grades of grain for feeding purposes. Much assistance has been rendered to fruit-growers by the analysis of fungicides and insecticides used for spraying purposes. The testing of well waters as found on Canadian farms has been continued and has proved of much value.

The Division of Entomology and Botany has sustained a great loss during the past year by the death of the late Dr. James Fletcher, who had charge of this division and who conducted the work most successfully and acceptably for twenty-one years. He was actively engaged in his work to within a short time of his decease and his sudden removal was sincerely regretted by all who knew him. Under Dr. Fletcher's guidance in the entomological section, much attention was paid to the study of the life-history of the many species of insects which are injurious to crops and to the testing of such remedies as have been suggested for their destruction. The habits of noxious insects which affect important grain crops were carefully studied. Attention was also given to insects affecting fodder plants, fruits, vegetables, &c.

Among the more important lines of work taken up in the section of Botany, has been the testing of the suitability of various grasses and fodder plants for profitable cultivation in Canada and the giving of information concerning noxious weeds. In the series of plots on the Central Farm devoted to the testing of grasses, useful work has been done, and, as a result of the trials made there, several very excellent grasses have been introduced into more general cultivation, especially on the Northwestern plains. Noxious weeds were made a special study by the late Dr. Fletcher, who devoted much attention to this branch. Since his death, this division has been reorganized. The Botany has been separated from the Entomology, each forming a division by itself. Mr. H. T. Güssow, late of the Botanical Laboratory of the Royal Agricultural Society of England, has been placed at the head of the Division of Botany, and Dr. C. G. Hewitt, from the University of Manchester, has been given charge of the Division of Entomology.

In the Poultry Division, much useful work has been done. New breeds of poultry have been introduced to ascertain how far they are adapted to the different climates in this country. Many experiments have been carried on in the artificial hatching and rearing of chickens, also in the breeding and cross-breeding of the different varieties. Successful efforts have been made, through special feeding, to bring on early moulting so that the hens may be brought on to lay earlier in the winter, when the prices paid for eggs are high. Tests have been made with different methods of feeding to bring about a larger production of eggs. Comparisons have also been made with the different breeds under trial as to their powers of annual egg-production. Experiments have also been carried on to gain information as to the rapidity with which the different sorts may be fattened, and their relative value for the table. Many different patterns of poultry-houses have been built and tested and the value of the colony

house demonstrated. This is a single or double-roomed, unheated house, large enough to accomodate from twenty to thirty fowls.

With the use of the trap-nest, the number of eggs laid by the individual hen is determined. Different groups of fowls have been formed, of good and poor layers, and important information gained as to their relative productiveness. The business in eggs and dressed fowls has been advanced by the publication of the results obtained from all these experiments. The diseases of poultry are also studied, and timely information given on this important subject.

The Branch Experimental Farms.

EXPERIMENTAL FARM, NAPPAN, N.S.

The Branch Farm at Nappan, Nova Scotia, is 826 miles east of Ottawa and eight miles from the boundary of New Brunswick. It is within half a mile of the Intercolonial railway station and consists of about three hundred acres. There are about fifty acres of marsh or dyke land, valuable for hay production; about fifty acres of lower upland, and about one hundred acres of higher upland. The remainder is covered with wood. This farm is fairly representative of the farms in that locality. In the maritime provinces, the spring is often very backward on account of cold, wet weather, and hence seeding is frequently delayed, necessitating fall-ploughing and the use of early-maturing varieties. At the time of the establishment of the Experimental Farm, there was very little fall-ploughing done in Nova Scotia; now it is almost universal and this change, due largely to the demonstrations made at the Nappan Farm, has resulted in better crops. Hay is the principal crop in the maritime provinces and important experiments have been conducted in the treatment of the dyke lands, on which a large part of the hay is grown.

Experiments are also carried on with grain and fodder crops. Turnips and mangels grow remarkably well there and are largely used in the feeding and fattening of stock. Potatoes also are extensively grown.

Apples have been successfully cultivated at Nappan and orchards established. Experiments have also been conducted there with pears, plums and cherries; also with most of the small fruits. Strawberries ripen there late in the season, when the crop is nearly over in other localities. Under such circumstances, the fruit commands a higher average price.

The trials undertaken with dairy cattle, also in the feeding of steers with special reference to the economical production of beef, have shown that the climate and conditions are favourable for such industries. Early-maturing varieties of cereals are also being tested.

EXPERIMENTAL FARM, CHARLOTTETOWN, P.E.I.

About sixty-five acres of land have recently been secured for an Experimental Farm near Charlottetown, about the centre of Prince Edward Island. This Farm is 995 miles from Ottawa, with a climate differing somewhat from that of Nappan. The Northumberland Straits, which lie between Nova Scotia and Prince Edward Island, usually fill with ice in the spring, which delays seeding, and on this account most crops ripen late. The summers are agreeably cool and everything matures slowly, the autumn being prolonged. The winter climate is modified and rendered milder by the proximity of the sea. Very fine crops of oats and potatoes are produced on the Island, and, in some districts, apples, cherries and most of the small fruits succeed well. Dairying is carried on successfully and much cheese is exported.

The experiments on this Farm, outside of the regular trial plots of all the more important crops, will, at first, be largely with clover and fodder plants; also with large and small fruits, and with methods of cultivating the soil and improving its fertility.

EXPERIMENTAL FARM, BRANDON, MAN.

The Branch Experimental Farm at Brandon is 1,548 miles west of Ottawa, and lies in the valley of the Assiniboine River, north of the city, and about one and one-half miles from the business centre. It consists of about 690 acres, from 200 to 250 of which being rich meadow land, along the margin of the river. Beyond this, the land rises and on this rise there are from 200 to 250 acres more of excellent land, well adapted for wheat, extending to the 'bluffs'. The bluffs vary in the angle they present to the land below; some of them rise with a gentle slope to the top, others are more or less precipitous, the spaces between them being broken up by ravines or coulées, in which grow a great variety of shrubs and trees which afford excellent shelter. The soil on these slopes and on the heights, including about 100 acres in all, is partly a sandy loam of good quality; in other places it is poor and gravelly. This is a very beautiful Farm, well planted with belts, clumps and avenues of trees. For twenty-one years this Farm has furnished object lessons to many thousands of farmers who have annually visited it and the agricultural lessons it has taught in connection with the treatment of the land and the cultivation of all sorts of crops have brought forth much fruit on many farms in Manitoba. Lessons in early sowing, proper depth to sow, quantity of seed per acre and best varieties to sow to produce an abundant crop, have been constantly given. These and many other like problems have engaged the attention of the Superintendent. Thousands of bundles of young trees grown on this Farm have been distributed among the farmers of Manitoba and used about their dwellings to make them more attractive. Tons of tree seeds, mailed in 1-lb. packages, have served a similar purpose. Many varieties of trees, shrubs and flowers serve to ornament the grounds.

Orchards for testing Russian and hardy cross-bred varieties of apples have been established, with many plantations of small fruits. Every sort of crop likely to be of value to the farmers in this western province has been tried and every effort made from year to year to demonstrate to the farmers of Manitoba the best methods to follow to increase the revenue from their farms.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

Indian Head is on the main line of the Canadian Pacific railway, in Southern Saskatchewan, 1,614 miles from Ottawa. The Farm, which adjoins the town, contains 680 acres, and has a mile frontage on the railway. When this Farm was selected, in 1887, the site was an unbroken prairie with no tree or shrub in sight as far as the eye could see. Now there are about 100,000 trees growing on this Farm in shelter belts, avenues, &c. In choosing this site, a bare prairie aspect was preferred in this instance, so that demonstration might be made of the possibility of tree planting on the plains and the opportunity afforded of showing the usefulness of trees for shelter. The surface of this Farm is slightly undulating, but nearly all of the land can be seen from the railway.

The soil is of excellent quality, most of it a friable clay loam mixed with varying proportions of sand and from one to two feet deep, with a yellowish clay sub-soil. Alhough there is not quite 200 miles distance between this Farm and that at Brandon, the climate is usually drier and hence the treatment of the soil is not quite the same. The practice of summer-fallowing, which has produced such important results in increased crops in southern Saskatchewan, was first tried in this district and its value fully demonstrated on the Experimental Farm at Indian Head. The process of the summer-fallowing of land may be described as follows:—

A farmer has, say, 300 acres of land which he desires to bring under crop. He divides this approximately into three fields of 100 acres each; two of these fields, previously prepared, he sows with grain; the other 100 acres he devotes to summer-fallow,

that is, to a bare fallow with no crop. The land to be fallowed is ploughed in the latter part of June at the time when the heavy spring rains occur, the moist soil is turned under and its capillary structure thus broken up, which prevents the escape of much moisture. Further, by this treatment millions of young weeds are buried and serve to enrich the soil. Later in the season, when the land has become more or less compact, it is treated with a suitable cultivator which tears up and destroys the later crop of weeds and pulverizes the surface, forming a mulch over the moist ground. A third cultivation is usually necessary before the season closes. The land will then be found in an excellent condition of tilth, ready to receive the seed in the following spring at the earliest moment practicable. As soon as the frost is out of the ground to a depth of six inches, the seed is sown about two inches deep. In the moist soil above the frost, the seed germinates promptly and, as the remainder of the frost thaws, the roots grow rapidly in the cool moist soil in which they are buried and, once the roots have a good start, a favourable balance is maintained between the root and top and a full, plump crop is generally had. A second crop of wheat is generally grown on stubble, the only cultivation given to the soil being with a disc harrow which cuts the surface three or four inches deep. After this second crop of wheat is taken off, the ground is again fallowed the following season, hence the farmer with three hundred acres of land crops only 200 acres each year, the other hundred being given up to summer-fallow. As a result of such treatment, the farmer has one hundred acres of land every season in the very best condition for growing wheat, which can be sown very early in the spring and in this land much of the mosture of the previous season is retained. The one hundred acres of crop which he has sown on stubble does not give him nearly as large a return as the summer-fallowed land, usually twenty to twenty-five bushels per acre when the summer-fallow gives thirty to thirty-five bushels, but the expense of preparing for this crop is small. Thus far, this method of treating the land has given the best results; there are some objections to summer-fallow, there is no doubt that a bare fallow is more or less wasteful of the fertility of the soil, but this seems to be the only way in which weeds can be subdued thoroughly and by which the moisture in the land can be increased. Experiments have been in progress at Indian Head and Brandon for many years with the object of substituting a leguminous crop such as clover, peas, or vetches for the bare summer-fallow, but these efforts have not yet been very successful. Up to the present time, notwithstanding that the process of summer-fallowing is somewhat wasteful, it is recommended as the best plan thus far devised to obtain a succession of good crops. The Indian Head Farm has produced remarkably large crops for the last twenty years, and this district, under the stimulus of the example of the Experimental Farm, has become one of the best wheat-growing localities in the Northwest. The average yield of the fourteen varieties of wheat under trial last year was nearly forty bushels per acre, while oats gave over eighty bushels. Tests are made each year with all sorts of promising crops, the results of which are published in the annual report of the Experimental Farms. This Farm is visited and the crops examined by a large number of farmers each season. The benefits conferred on the farmers of the Canadian Northwest by the demonstrations made have been very great.

A large number of fruits have been tested and all the small fruits have been found quite hardy, but most of the larger fruits have proved to be tender. Many varieties of ornamental trees and shrubs have been introduced and about 200 of these have been found hardy, thus giving the farmer a large amount of material from which to select, in his efforts to improve and beautify his surroundings.

EXPERIMENTAL FARM, ROSTHERN, SASK.

This Farm has been recently established to serve the purposes of northern Saskatchewan. It has been located near Rosthern, 1,857 miles west of Ottawa, and less

than a mile from the railway station. The area of land secured here is about 155 acres, nearly all of which has been under cultivation. It is not proposed to conduct experiments with stock on this farm but to test all promising farm crops likely to succeed in the district, and to conduct experiments looking to a proper rotation of crops and to adopt the best methods of preparing the land. Experiments will be conducted with small fruits such as currants, gooseberries, raspberries and strawberries, also with such varieties of apples as are likely to succeed in that climate. It is proposed to test also a number of varieties of forest and ornamental trees, shrubs and flowers with the object of making this Farm an attractive spot and at the same time conveying to the farmers information as to the varieties which are likely to succeed with them. Meteorological observations will be taken regularly and farmers all through that district will be encouraged to visit the Farm and inspect the various lines of experimental work carried on.

EXPERIMENTAL FARM, LETHBRIDGE, ALTA.

A site in the neighbourhood of Lethbridge has been chosen for the Experimental Farm for southern Alberta. It consists of 400 acres of land and is situated one mile east of the city limits, 107 miles south of Indian Head, 2,067 miles west of Ottawa.

About 100 acres of this land is irrigable and the remaining 300 acres non-irrigable, so that experiments can be conducted with irrigation and also under dry-farming conditions. The soil of this farm is quite uniform, being a dark-gray coloured loam. Suitable buildings have been erected and a considerable area of land was under crop last year, 155 acres having been broken, of which 47 acres were in the irrigated portion. Many experiments were conducted with winter wheat on the non-irrigated land, and very good crops were secured, averaging for the greater part about 40 bushels per acre. Many experiments were conducted in 1908 on irrigated and non-irrigated land with spring wheat, oats, barley, peas, Indian corn, turnips. mangels, sugar beets and potatoes, and the results given in the annual report of the Farm. Much useful information is being acquired in this way regarding the crops of this district. Alfalfa, grown from seed obtained from different sources, is succeeding well in that locality and heavy crops have been had.

A large quantity of trees and shrubs have been planted in shelter belts and on the grounds, especially about the buildings. Orchards of cross-bred and Russian seedling apples of the hardiest sorts have been set out and plantations made of many different sorts of small fruits.

EXPERIMENTAL FARM, LACOMBE, ALTA.

An Experimental Farm has also been chosen for central Alberta within a mile of the town of Lacombe, which is 2,253 miles west of Ottawa and 78 miles south of Edmonton. It is in the centre of a large farming and stock district. There experiments are being carried on with many different sorts of grasses, clovers and fodder plants, special attention being paid to alfalfa, clover and timothy. The experiments conducted on the uniform trial plots of the most important farm crops are in progress here also. Lacombe is a railway centre where farmers from considerable distances can conveniently visit the Farm and gain information as to the results obtained from the many different lines of work conducted. The soil of this farm fairly represents the soil of the district, and in area contains about 160 acres. It is admirably located in full view of the passing trains and within a mile of the railway station. Suitable buildings have been erected on this site and active work has been carried on for the past two years. An extensive assortment, comprising several thousand specimens of forest and ornamental trees, with fruit trees, shrubs and small fruits have been planted on this farm to ascertain what varieties will be hardy and useful here.

EXPERIMENTAL FARM, AGASSIZ, B.C.

The Experimental Farm for the coast climate of British Columbia was established in 1889 at Agassiz, 2,711 miles west of Ottawa and 70 miles east of Vancouver. In this Farm there are about 325 acres of valley land and over 700 acres of mountain land which has been attached to the Experimental Farm so as to preserve the fine timber growing on the mountains in rear of the Farm from fire. These mountains rise to a height of about twelve hundred feet. The land in the valley is somewhat variable but most of it is very suitable for growing fruit, for which this Farm seems fairly well adapted. While the uniform trial plots, which cover experiments with all the more important farm crops, are conducted here as at the other Farms, the other part of the land has been devoted to the testing of different varieties of fruit, such as apples, pears, plums and cherries. In apples alone more than 1,200 named varieties have been tested, embracing nearly every sort of apple obtainable in all countries where apples are grown. Orchards containing a large number of the other sorts of large fruits have also been established. As these have borne fruit, the habits of the trees and the quality of the fruit have been described and thus a volume of useful records has been accumulated. Where a variety of fruit has proven valuable, it has been retained, but all the inferior sorts have been rooted up as soon as their inferiority was sufficiently established. In this way, much useful information on the question of varieties, as to their value, also as to their adaptablity to the climatic and other conditions prevailing at Agassiz has been obtained. In the prosecution of this work, some varieties of fruit have been found to possess unusual quality and great merit and these have been added to the list specially suited for cultivation in the coast climate of British Columbia. As the great work of testing varieties is now overtaken, commercial orchards have been established within the past three or four years consisting only of the finest varieties, of which twelve trees of each sort are planted. The fruits from these trees will be marketed and the proceeds of the crops made known. Orchards have also been established on the sides of the mountain in rear of the Farm at varying heights from about 200 to 1,100 feet, and thus it has been demonstrated that much land of this character, unsuited for farm crops, may be advantageously devoted to fruit-growing. Experiments have been also conducted with many different sorts of vegetables and small fruits, which have succeeded well here. An orchard of nut trees has also been established, consisting chiefly of different varieties of walnuts and chestnuts, most of which have now been bearing fruit for some years. These nuts are saved and distributed to farmers for planting, and in this way small groves have been established in many parts of that province.

The climate is very favourable for the growth of trees of many kinds. Forest plantations of valuable sorts of timber trees have been made and many groups of ornamental trees valuable for the decoration of lawns and grounds have been planted, and thus an example set which has been freely copied.

SMALLER EXPERIMENTAL STATIONS.

In addition to the nine Experimental Farms already referred to, there are three smaller stations, on farms occupied by settlers, where a portion only of the land has been rented for experimental purposes. One of such stations has been established near Kamloops, a very dry district, 2,527 miles west of Ottawa, where ten acres have been secured from Mr. E. W. Calhoun, with the object of growing cereals under dry-farming conditions. The land was ploughed and got into condition early this season and about two acres of winter wheat was recently sown. The remainder of the land will be occupied in the spring with other important farm crops.

A Second Station has been obtained near the southern end of Lake Abitibi in Quebec, near the Ontario line adjacent to the Grand Trunk Pacific railway. Five

acres of land is supplied there on a farm belonging to Mr. Frank Moberley. Winter wheat tested in that neighbourhood last year produced fine samples, and, this season, a number of varieties of spring grain have been sown. Experiments are also being tried in that locality with fodder plants and fruits, including a few young apple trees. As yet, scarcely anything is known of the possibilities of agriculture in that locality.

A Third Station has been secured at Fort Vermilion on the Peace River, 3,030 miles northwest of Ottawa and about 700 miles north of Edmonton by mail route, where five acres of land in a good state of cultivation have been obtained from Mr. Robert Jones, one of the older settlers at that point, and his services have been secured for carrying on the experiments. The arrangements for carrying the mails in that remote district seem somewhat primitive; the trips are made once a month and the 400 miles of roads over which the mail is carried are said to be very bad. On this account, the mail bag containing the seeds for experimental work, carefully packed and sealed and forwarded early in May, was left somewhere by the roadside on the way and picked up on the next trip a month later. Thus the seeds did not reach Fort Vermilion until June, when it was too late to use them and they were held over to be sown in the spring of 1909. In the absence of material for his experimental work, Mr. Jones gave much of his time that season to the examination of the crops grown by farmers in that district, and obtained samples of some of the cereals which were forwarded to Ottawa with the names of the growers. Mr. Jones thinks he is quite safe in estimating the wheat crop of 1908 in the Fort Vermilion district at 35,000 bushels, with an average yield of 24 bushels to the acre. He also estimates barley at 5,000 bushels, with an average yield of 60 bushels per acre, and the crop of oats at about 4,000 bushels.

The experimental plots of turnips gave a crop of over 16 tons to the acre, mangels 15 tons, and white carrots 12½ tons to the acre.

The hardy cross-bred apple trees produced at Ottawa, also some hardy Russian sorts, which were sent to Fort Vermilion in the spring of 1907, survived the winter of 1907-8 and made good growth during 1908, some of them as much as two feet. Some plum trees sent at the same time also made strong growth. Mr. Jones, writing on the 15th of October, says: 'Although most of our native trees are stripped of their foliage by frost, the leaves of the apple and plum trees are quite green yet.'

About 25 varieties of black, white and red currants and three different sorts of raspberries all survived the winter of 1907, which was reported as very severe. More than 50 hardy sorts of trees and shrubs also survived the winter and are reported as doing well.

Writing on August 29, 1908, Mr. Jones says: 'My garden vegetables are promising large yields; some of my carrots measure three inches in diameter and I have cauliflowers which weigh ten pounds each, also tomatoes of good size which are almost ripe now. The yield of potatoes will be large also; the earliest ones were ready for the table July 13.'

The samples of wheat received from Fort Vermilion were very fine and well-matured and unusually heavy. There were five samples in all, and their dates of sowing and harvesting were as follows:—

Variety.	Date of Sowing.	When Ripe.	When Cut.	Weight per Bushel.
				Lbs.
Preston	May 6	August 10	August 22	64¼
Ladoga	April 31		September 5	64
Ladoga	May 4	August 17	August 21	64
Early Riga	April 21		" 21	63
Riga	May 9		" 29	64¼

No samples of Red Fife could be obtained. All the varieties grown here are earlier than Red Fife and hence are preferred. These varieties have all been grown from samples sent to settlers in years past from the Experimental Farms.

Two samples of oats were received, one of Banner which weighed 41½ lbs. per bushel, and one unnamed which weighed 42 lbs. per bushel. Banner was sown May 16 and was ripe August 24. One sample of barley was received, unnamed. This was sown May 16 and was cut August 12 and weighed 49½ lbs. per bushel. There was also one sample of peas sown May 3 and harvested August 12, weighing 64 lbs. to the bushel.

From the dates of sowing and ripening, the absence of injury from frost, and the weights of the samples of grain sent, it is evident that the season of 1908 was quite as favourable for crop-growing at Fort Vermilion, as it was in many parts of Alberta further south.

From recent letters the following information has been obtained. Writing on June 28, 1908, Mr. Jones says: 'Everything on the Experimental Farm is looking well. The different varieties of wheat are now eighteen inches high, Preston being in the lead. Lettuce and radishes, sown on May 20, were ready for use June 9. Squash, melons and cucumbers were set back very much by frost on June 3, but are picking up again now. The crops in general are looking first-rate. Of the apple trees sent, 36 are growing well. From the list of ornamental trees and shrubs, the following have already bloomed:—

Caragana frutescens..	June 14, Bloom.
Caragana pygmaeus..	" 18 "
Lonicera Alpina..	" 14 "
Lonicera Fenzlei..	" 14 "
Lonicera virginalis alba..	" 13 "
Lonicera mundeniensis..	" 12 "
Euonymus linearis..	Budded June 7, in bloom ever since.
Ribes aureum..	June 10, Bloom.
Lilac Chas. X..	" 1 "
Syringa villosa..	" 20 "
Spiraea arguta..	" 8 "

Of raspberries, I have about forty plants each of Heebner and Herbert, and they are doing well, also 150 plants of strawberries. Currants are doing remarkably well. The different varieties of alfalfa which I sowed on May 8 are five inches high, and in a few days I shall be giving it the first cutting. I had sufficient Brome grass seed to sow an acre. (A sample was inclosed in his letter measuring over two feet in height.) The different varieties of potatoes planted May 18 and 19 are in full bloom now.'

In the last letter, received July 24, 1909, he says: 'I cut my alfalfa on July 8, and from all the plots obtained about 1½ tons. Everything is progressing most favourably; all the wheats were fully headed on July 10, and at present are about 3 feet 6 inches in height. The barley and oats are also very well advanced and there is every prospect of a good yield. Under separate cover, I am sending you a sample of strawberries. (These came duly to hand and were of good size.)

Garden peas, sown May 19, were large enough for table use on July 20. Flower seeds, which were sown after everything else was planted, are just coming into bloom; among these may be mentioned California Poppy, Candytuft, Pansies, Sweet Peas, Mignonette and Phlox Drummondi. The apple trees and ornamental shrubs are doing very well. Indian corn is doing very well, some of it is now three feet high.'

I have dwelt in some detail on the progress made at this last station on account of the interest attached to a locality so far distant and about which so little is known, for which, I trust, I shall be excused.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

(With final notes.)

In the Annual Report of the Experimental Farms for 1893, details were given, on pages 8 to 24, of the results of a series of tests which had then been carried on for some years, on plots of one-tenth acre each, with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops.

These experiments have been continued, and a summary of the results obtained has been given each year, by taking the average yield of crops from the beginning of the test, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-8 and its subsequent treatment, the reader is referred to the earlier issues of this report.

In 1888, when the experiments under discussion were begun, little was definitely known in Canada of the action of various materials in increasing fertility of soil and it was with a view of securing information on the subject that these tests were made. The plots were never intended to serve as models such as a farmer could copy to advantage in his general practice. On the contrary, to gain the information desired it has been found necessary to use some fertilizers in unusual quantities and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which, in ordinary farming, would be extravagant or detrimental; also, since the character of the season has a more immediate effect on the crop than the fertilizer applied, it was desirable to gain fuller light on this subject by extending the experiment over a long period so that averages of results might be obtained for good and bad years.

VALUABLE INFORMATION GAINED.

From this long-continued series of tests some useful information has been gained.

These trials have shown that barnyard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barnyard manure, it is difficult to estimate the value of this one item of information.

In the second group, the value of clover as a fertilizer has been clearly shown. In addition to the nitrogen gathered from the air, it adds to the mineral plant foods available by collecting them from depths not reached by the shallower root-systems of other farm crops. It serves as a catch crop, retaining fertilizing material brought down by the rain and snow, much of which would otherwise be lost. It also supplies the land with a large addition of humus and results in deepening and mellowing the soil.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Many years' experience has shown that mineral phosphate, untreated, is practically of no value as a fertilizer.

Sulphate of iron, which, at the time these tests were begun, was highly recommended as a means of producing increased crops, has also proven to be of very little value for this purpose.

Common salt, which has long had a reputation for its value as a fertilizer for barley, with many farmers, while others disbelieved in its efficacy, has been shown to be a valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proved to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this, it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barnyard manure had been applied, was much depleted of humus, hence its power of holding moisture had been lessened, and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899, the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year, ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage, varying in height and density on the different plots, which was ploughed under. No barnyard manure was applied on plots 1 and 2 in each series from 1898 to 1905.

In 1900 all the fertilizers on all the plots were discontinued, and from then to 1905 the same crops were grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some additional information has been gained as to the value of clover as a collector of plant-food, and also as to the unexhausted values of the different fertilizers which had been used on these plots since the experiments were begun. In 1905-1909 inclusive, all the fertilizers were again used as in 1898.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their places, in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn, about the middle of that month. Then roots and Indian corn were again sown. In 1902 also, crops of Indian corn and roots were grown on these plots. In 1903 the land was again devoted to clover and was in Indian corn and roots again in 1904 and each year since.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of about 1½ bushels per acre, excepting in 1894; and the varieties used were as follows:—In 1888 to 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, Rio Grande was used, and from 1895 to 1909, inclusive, Red Fife. In 1909, the Red Fife was sown May 20 and was ripe September 8.

TABLE I.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT.

Number of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905-9 fertilizer again applied as in 1898. Clover discontinued.	Average Yield for Twenty-one Years.			22nd Season, 1909. Variety, Red Fife.			Average Yield for Twenty-two Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow-manure), well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre again used....	21	$54\frac{10}{21}$	3679	14	40	2620	21	$34\frac{16}{22}$	3631
2	Barn-yard manure (mixed horse and cow-manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre again used....	22	$2\frac{16}{21}$	3708	15	20	2120	21	$44\frac{10}{22}$	3636
3	Unmanured from the beginning....	11	$16\frac{14}{21}$	1806	4	0	680	10	$56\frac{18}{22}$	1755
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. From 1905-9 Thomas phosphate again used as in 1899....	12	15	1939	4	0	760	11	$52\frac{11}{22}$	1885
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899....	13	$13\frac{2}{21}$	2505	8	40	1180	13	$0\frac{15}{22}$	2445
6	Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1899 to 1905. From 1905-9 fertilizer again used as in 1898....	19	$13\frac{5}{21}$	3121	9	40	1520	18	$47\frac{4}{22}$	3048
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899....	13	51	2522	8	0	1260	13	$35\frac{1}{22}$	2465

TABLE I.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905-9 fertilizer again applied as in 1898. Clover discontinued.	Average Yield for twenty-one Years. Yield of Grain. Per acre.		Average Yield for twenty-one Years. Yield of Straw. Per acre	22nd Season, 1909 Variety, Red Fife. Yield of Grain. Per acre.		22nd Season, 1909 Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Twenty-two Years. Yield of Grain. Per acre.		Average Yield for Twenty-two Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899...	11	$43\frac{17}{21}$	2107	4	50	750	11	25	2045
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899	12	$18\frac{5}{21}$	1893	4	40	600	11	$57\frac{9}{22}$	1834
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899 ...	13	$16\frac{20}{21}$	2720		30	1050	13	$1\frac{4}{22}$	2644
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899..........	14	$11\frac{6}{21}$	2725	7	50	1170	13	$53\frac{20}{22}$	2655
12	Unmanured from the beginning..........	10	$10\frac{20}{21}$	1764	3	0	560	9	$51\frac{8}{22}$	1710
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 bone again used as at first........	12	$27\frac{16}{21}$	1991	5	0	700	12	$7\frac{9}{22}$	1933
14	Bone, finely ground, 500 lbs., wood ashes unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	15	$14\frac{16}{21}$	2506	11	20	1220	15	$4\frac{2}{22}$	2448
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	13	$55\frac{2}{21}$	2351	8	10	960	13	$39\frac{9}{22}$	2288
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	15	$1\frac{2}{21}$	2176	8	0	1010	14	$41\frac{21}{22}$	2123
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	12	$41\frac{6}{21}$	2327	6	10	1440	12	$23\frac{11}{22}$	2287
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first...... ...	12	$23\frac{16}{21}$	1928	6	0	680	12	$6\frac{7}{22}$	1871
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first........................	13	19	1620	4	40	560	12	$55\frac{9}{22}$	1572
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first.........	12	$35\frac{8}{21}$	1873	4	40	670	12	$13\frac{17}{22}$	1818
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	12	$56\frac{9}{21}$	1857	5	20	720	12	$35\frac{15}{22}$	1806

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was about 2 bushels from 1889 to 1891, 1½ bushels in 1892 and 1893, and 2 bushels from 1894 to 1909, inclusive. Two-rowed barley was used for seed throughout until 1902, when Mensury, a six-rowed sort, was tried. The varieties used were as follows: 1889 to 1891, Saale; 1892, Goldthorpe; 1893, Duckbill; and in 1894 to 1901, Canadian Thorpe, a selected form of the Duckbill. Since 1902, Mensury has been sown. In 1909 it was sown May 26, and was harvested on August 25.

TABLE II.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905–9 fertilizer again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre	21st Season, 1909, Variety, Mensury. Yield of Grain. Per acre.		21st Season, 1909, Variety, Mensury. Yield of Straw. Per acre	Average Yield for Twenty-one Years. Yield of Grain. Per acre.		Average Yield for Twenty-one Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre again used......	36	32 12/20	2917	21	42	1710	35	46 16/21	2860
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre again used................	37	10	2981	22	44	1900	35	26 4/21	2930
3	Unmanured from the beginning....	14	45 11/20	1427	8	16	740	14	30 9/21	1394
4	Mineral phosphate, untreated, finely ground 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899	16	29 10/20	1505	9	28	520	16	13 9/21	1458
5	Mineral phosphate, untreated, finely ground 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899..............	22	40 2/20	2150	14	8	1360	21	35 19/21	2112
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1898.......	30	22 5/20	2373	14	28	1040	29	33 20/21	2310
7	Mineral phosphate, untreated, finely ground 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer used as in 1899............................	28	37 4/20	2373	16	12	1260	28	8 12/21	2320

TABLE II.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY.—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905-9 fertilizer again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre	21st Season, 1909. Variety, Mensury. Yield of Grain. Per acre.		21st Season, 1909. Variety, Mensury. Yield of Straw. Per acre	Average Yield for Twenty-one Years. Yield of Grain. Per acre.		Average Yield for Twenty-one Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-09 fertilizer again used as in 1899..........	23	$32\frac{19}{21}$	1829	14	28	600	25	$12\frac{3}{21}$	1771
9	Mineral superphosphate No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899......	22	$18\frac{1}{20}$	1693	8	16	900	21	$33\frac{20}{21}$	1656
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre. used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899....	28	35	2285	13	16	1020	27	$47\frac{17}{21}$	2225
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899....	28	$25\frac{18}{20}$	2371	19	8	1620	28	$4\frac{2}{21}$	2335
12	Unmanured from the beginning	14	$32\frac{3}{20}$	1195	4	8	400	14	$8\frac{3}{21}$	1157
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 bone again used as at first......	16	$23\frac{7}{20}$	1327	9	8	640	16	$6\frac{13}{21}$	1294
14	Bone finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	24	$41\frac{18}{20}$	2036	21	22	1000	24	34	1987
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	22	$1\frac{15}{20}$	2062	12	24	860	21	$27\frac{20}{21}$	2005
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905 From 1905-9 fertilizer again used as at first....	23	$0\frac{17}{20}$	1714	17	4	810	22	$35\frac{6}{21}$	1671
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first....	19	$5\frac{7}{20}$	1760	8	36	640	18	$29\frac{14}{21}$	1707
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905 From 1905-9 fertilizer again used as at first...	19	$25\frac{1}{20}$	1505	10	10	510	19	$4\frac{1}{21}$	1458
19	Common salt (Sodium chloride) 300 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first........................	27	$37\frac{5}{20}$	1810	11	32	1040	27	$0\frac{9}{21}$	1774
20	Land plaster or gypsum (calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first.....	20	$47\frac{18}{20}$	1467	8	36	680	20	$19\frac{18}{21}$	1430
21	Mineral superphosphate, 500 lbs. per acre. used each year from 1889, to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first............................	21	$23\frac{11}{20}$	1614	9	28	680	20	$44\frac{7}{21}$	1570

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was about 2 bushels in 1889 and 1890; 1½ bushels from 1891 to 1893, and 2 bushels from 1894 to 1909, inclusive. The varieties used were as follows: In 1889, Early English; in 1890 to 1893, Prize Cluster; and from 1894 to 1909, inclusive, the Banner. In 1909, Banner was sown May 26 and the plots were harvested August 31.

TABLE III.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905-9 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years.			21st Season, 1909. Variety, Banner.			Average Yield for Twenty-one Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre were again used.	51	30 5/20	3067	45	30	2400	51	20 11/21	3036
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. From 1905-9, 15 tons per acre were again used......	54	24 14/20	3240	46	16	1860	54	11 7/21	3174
3	Unmanured from the beginning	34	0 5/20	1646	14	14	820	33	3	1607
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899..................	36	4 16/20	1874	28	8	1100	35	26	1837
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1909 to 1905. From 1905-9 fertilizers again used as in 1899...	47	25	2642	40	20	2240	47	13 9/21	2623
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1899 to 1905. From 1905-9, fertilizers again used as in 1898..	47	33	2682	41	6	2120	47	22	2656
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899....	47	25 18/20	3002	41	6	2600	47	15	2983
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899..............	42	30 15/20	2437	30	6	940	42	11 16/21	2366

TABLE III.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS—*Concluded.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. From 1905-9 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre	21st Season, 1909. Variety, Banner. Yield of Grain. Per acre.		21st Season, 1909. Variety, Banner. Yield of Straw. Per acre	Average Yield for Twenty-one Years. Yield of Grain. Per acre.		Average Yield for Twenty-one Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899	37	$18\frac{7}{20}$	1919	22	32	920	36	$28\frac{14}{21}$	1872
10	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899	45	$31\frac{10}{20}$	2476	32	12	1660	45	$9\frac{11}{21}$	2437
11	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs., per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899	37	$16\frac{19}{20}$	2264	14	4	1520	36	$13\frac{2}{21}$	2229
12	Unmanured from the beginning	22	$25\frac{18}{20}$	1397	7	2	320	22	$0\frac{7}{21}$	1346
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 bone again used as at first	34	$8\frac{15}{20}$	1855	22	32	1580	33	$24\frac{9}{21}$	1842
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers used again as at first	39	$22\frac{6}{20}$	2193	27	22	1760	39	$2\frac{18}{21}$	2172
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	45	$9\frac{8}{20}$	2564	28	8	1180	44	$15\frac{17}{21}$	2498
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	39	$15\frac{5}{20}$	2086	37	22	1280	39	$12\frac{7}{21}$	2048
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	45	$25\frac{13}{20}$	2644	34	4	1280	45	$6\frac{17}{21}$	2579
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	39	$12\frac{14}{20}$	1970	30	20	1120	38	$32\frac{10}{21}$	1930
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer used again as at first	39	$17\frac{5}{20}$	1960	31	26	1180	39	$4\frac{18}{21}$	1923
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	35	33	1969	27	22	1000	35	$19\frac{11}{21}$	1923
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	36	$20\frac{1}{20}$	1847	28	8	1200	35	$21\frac{10}{21}$	1816

The one-tenth acre plots of wheat, barley and oats had, by the end of 1903, become infested with several troublesome perennial weeds, hence it was thought best to sow only one-half of each plot with grain in 1904, devoting the other half to a hoed crop to clean the land. On this account, no clover was sown on any of the cereal plots in 1904, and one-half of each wheat plot was sown with mangels, one-half of each barley plot with potatoes, and one-half of each oat plot with carrots, computing the yields of grain from a one-twentieth acre plot in each case. Similar hoed crops were sown in 1905, 1906, 1907, 1908 and 1909, changing the position of the varieties from year to year.

INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and of having the corn so well advanced when cut, that the ears shall be, as far as is practicable, in the late milk or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger-growing and somewhat later-ripening sorts has been tried, and on the other, marked No. 2, one of the earlier-maturing varieties. During the first four years, one of the Dent varieties was tested under No. 1. On the other half of the plot (No. 2) one of the Flint varieties was grown. For the first four years, the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches apart, and the No. 2 in hills 3 feet apart each way, with 4 or 5 kernels in a hill. During the past twelve years, both sorts have been grown in hills.

In 1900, no crop of Indian corn was grown on these plots, but red clover was sown in its place on May 5 in the proportion of 12 pounds per acre. This made a strong growth, was cut twice during the season and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 20, 1901. It was then ploughed under about 6 inches deep, and harrowed well before the corn was planted. Clover was sown again in 1903, and ploughed under in May, 1904. Corn was planted in 1905, 1906, 1907, 1908 and 1909. In 1909 it was planted on June 1, and cut for ensilage September 21.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. From 1905-9 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Seventeen Years.				18th Season, 1909.				Average Yield for Eighteen Years.			
		½ Plot No. 1—weight of green fodder.		½ Plot No. 2—weight of green fodder.		½ Plot No. 1—Selected Leaming, weight of green fodder.		½ Plot No. 2—Longfellow, weight of green fodder.		½ Plot No. 1—weight of green fodder.		½ Plot No. 2—weight of green fodder.	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre each year from 1888 to 1898 inclusive. No manure used from 1899 to 1905. From 1905-9 manure was again used as at first.	15	1801	12	1552	15	1620	10	1300	15	1791	12	1316
2	Barn-yard manure (mixed horse and cow-manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure used from 1899 to 1905. From 1905-9 manure was again used as at first........	15	15	11	921	10	1500	9	1800	14	1542	11	748
3	Unmanured from the beginning..........	6	407	4	1751	1	1880	1	1080	5	1933	4	1380

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Continued.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. From 1905-9 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Seventeen Years.				18th Season, 1909.				Average Yield for Eighteen Years.			
		1. Plot No. 1—weight of green fodder. Per acre.		2. Plot No. 2—weight of green fodder. Per acre		1. Plot No. 1—Selected Leaming, weight of green fodder. Per acre.		2. Plot No. 2—Longfellow, weight of green fodder. Per acre		1. Plot No. 1—weight of green fodder. Per acre.		2. Plot No. 2—weight of green fodder. Per acre	
		Tons.	lbs.	Tons	lbs.	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
4	Mineral phosphate, untreated, finely ground, 800 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899......	7	1653	5	1070	3	520	3	180	7	1146	5	798
5	Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 800 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899..	11	178	9	100	5	1260	6	920	10	1572	8	1812
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1899 to 1905. From 1905-9 fertilizers again used as in 1898...	15	641	11	1314	9	1000	9	1000	14	1994	11	1074
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899...	14	682	10	1664	9	220	9	1680	14	101	10	1554
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899...	11	1429	9	652	6	580	5	1140	11	826	9	235
9	Mineral superphosphate, No. 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899	10	1457	7	1654	5	1260	4	440	10	891	7	1253
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899...	12	666	9	1597	5	1800	5	100	11	1951	9	1069
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899...	15	410	11	1731	9	920	8	760	14	1772	11	1344

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. From 1905-9 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Seventeen Years. ½ Plot No. 1—weight of green fodder.	Average Yield for Seventeen Years. ½ Plot No. 2—weight of green fodder.	18th Season, 1909. ½ Plot No. 1—Selected Leaming, weight of green fodder.	18th Season, 1909. ½ Plot No. 2—Longfellow, weight of green fodder.	Average Yield for Eighteen Years. ½ Plot No. 1—weight of green fodder.	Average Yield for Eighteen Years. ½ Plot No. 2—weight of green fodder.
		Per acre.	Per acre	Per acre.	Per acre	Per acre.	Per acre
		Tons. lbs.	Tons lbs	Tons. lbs.	Tons lbs	Tons. lbs.	Tons lbs
12	Unmanured from the beginning	10 240	8 783	5 800	3 640	9 1716	8 220
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 bone again used as at first	11 701	8 1918	4 240	3 860	10 1898	8 1304
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs., per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as at first ..	12 805	9 1609	6 1540	6 1380	12 179	9 1263
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first ...	11 42	9 76	5 300	4 1300	10 1390	8 1589
16	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first	11 1904	9 982	6 1640	4 1680	11 1334	9 465
17	Mineral superphosphate, No. 1, 600 lbs., muriate of potash, 200 lbs., sulphate of ammonia, 150 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as at first...	13 1	9 1732	8 240	6 740	12 1459	9 1344
18	Muriate of potash, 300 lbs. per acre used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first ...	9 1910	7 1165	5 140	5 360	9 1436	7 898
19	Double sulphate of potash and magnesia, 300 lbs., per acre in 1889 and 1890, (muriate of potash, 200 lbs., substituted, each year since), dried blood, 300 lbs., mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as at first	12 162	9 399	6 1940	7 80	11 1594	9 159
20	Wood ashes, unleached, 1,900 lbs. per acre used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first...........	10 1713	8 1082	6 1100	6 700	10 1235	8 839
21	Bone, finely ground, 500 lbs., sulphate of ammonia, 200 lbs., muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizers again used as at first	12 38	7 1448	9 1200	6 200	11 1769	7 1268

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments, the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil has been returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. Until 1900 it was

ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barnyard manure had been spread on plots 1, 2 and 6, and after gang-ploughing, the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

The variety of mangel principally grown was the Mammoth Long Red, and about four pounds of seed were sown per acre each year.

The variety of turnip chiefly sown was the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. About three pounds of seed were sown per acre.

In 1900 and 1903, no crops of mangels or turnips were grown, but clover was sown in their place in May at the rate of 12 pounds per acre. This made a strong growth and was cut twice each year during the season, and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until near the middle of May, the year following, by which time it had made a very heavy growth. It was then ploughed under about 6 inches deep and harrowed well, then made into ridges 2 feet apart. These were rolled with a hand roller, which flattened the ridges considerably and made a firm, even seed bed. The crops of clover and roots were alternated in this way, for the purpose of supplying humus and also of gaining information as to the fertilizing effect of green clover ploughed under on land to be used for growing roots.

From 1904 to 1909, inclusive, the roots were grown each year. In 1909 both the mangels and the turnips were sown on May 26, and pulled on October 12. The yield per acre has been calculated in each case from the weight of roots gathered from the whole plot.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizer used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-9 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Seventeen Years.				18th Season, 1909, Varieties.				Average Yield for Eighteen Years.			
						East Half Plot.		West Half Plot.					
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		Turnips, Purple Top Swede, Weight of Roots.		Mangels, Mammoth Long Red, Weight of Roots.		Mangels, Weight of Roots.		Turnips, Weight of Roots.	
		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure (mixed horse and cow-manure) well rotted, 20 tons per acre each year from 1889 to 1898 inclusive. No manure used from 1899 to 1905. From 1905-9, manure was again used as at first.	21	377	14	605	14	680	17	1500	20	195	14	609
2	Barn-yard manure (mixed horse and cow-manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure used from 1889 to 1905. From 1905-9 manure was again used as at first.	20	990	14	846	15	440	20	20	20	936	14	935
3	Unmanured from the beginning	8	663	6	1447	4	1200	3	1480	8	153	6	1211
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, used each year from 1889 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in 1899	8	644	7	1011	8	260	4	140	8	172	7	1080

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Con.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. From 1905-9 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Seventeen Years.		18th Season, 1909, Varieties.		Average Yield for Eighteen Years.	
				East Half Plot.	West Half Plot.		
		Mangels, Weight of Roots.	Turnips, Weight of Roots.	Turnips, Purple Top Swede, Weight of Roots.	Mangels, Mammoth Long Red, Weight of Roots.	Mangels, Weight of Roots.	Turnips, Weight of Roots.
		Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.
		Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.
5	Mineral phosphate, untreated, finely ground, 1,000 lbs., nitrate of soda, 250 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899.	14 1026	9 997	11 20	16 1260	14 1261	9 1108
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1889 to 1897 inclusive. In 1898, 1,000 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. From 1905-9 fertilizers again used as in 1898.	16 1889	11 1325	12 280	16 940	16 1836	11 1328
7	Mineral phosphate, untreated, finely ground, 1,000 lbs. sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years), nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899 1,000 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899	12 760	8 1755	10 1200	16 1920	12 1213	8 1947
8	Mineral superphosphate, No. 1, 500 lbs., sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years), nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as in 1899.........	13 1288	10 1857	12 940	14 460	13 1353	11 28
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as in '99.	9 766	8 1462	11 420	8 200	8 624	8 1738
10	Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer used again as in 1899.........	13 811	8 1837	12 1240	9 1800	13 422	9 248
11	Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9, fertilizer used again as in 1899 ...	11 1073	10 63	10 640	5 1060	11 406	10 95

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. From 1905-9 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Seventeen Years.		18th Season, 1909, Varieties.		Average Yield for Eighteen Years.	
		Mangels, Weight of Roots.	Turnips, Weight of Roots.	East Half Plot. Turnips, Purple Top Swede, Weight of Roots.	West Half Plot. Mangels, Mammoth Long Red, Weight of Roots.	Mangels, Weight of Roots.	Turnips, Weight of Roots.
		Per acre.	Per acre.	Per acre.	Per acre.	Per acre.	Per acre.
		Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.
12	Unmanured from the beginning....	6 1700	6 1357	3 0	2 200	6 1172	6 948
13	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first. .	11 1558	8 659	9 160	7 1020	11 1084	8 743
14	Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first..	10 1533	7 1441	5 1960	8 80	10 1230	7 1248
15	Common salt (Sodium chloride), 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first..	9 966	7 330	5 1120	5 160	9 477	7 152
16	Mineral superphosphate, No. 1, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first. ..	11 1745	9 936	12 1960	8 520	11 1344	9 1326
17	Mineral superphosphate, No. 1, 350 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first	12 1015	10 199	8 1720	9 1220	12 693	10 61
18	Mineral superphosphate, No. 1, 500 lbs., muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first..	12 1499	10 810	9 160	13 60	12 1530	10 663
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since), dried blood, 250 lbs., mineral superphosphate No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first........	13 1616	11 138	11 220	14 140	13 1645	11 143
20	Wood ashes, unleached, 1,500 lbs., common salt (Sodium chloride), 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. From 1905-9 fertilizers again used as at first.	14 1207	9 1655	8 160	11 920	14 858	9 1461
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. From 1905-9 fertilizer again used as at first...	13 1533	10 220	8 520	8 1800	13 992	10 15

The final result of these experiments may perhaps be presented more clearly by dividing them into three groups covering three periods, namely:—1. Fertilizers used as originally planned, from 1888 to 1898 and 1899. 2. Fertilizers discontinued and clover grown, 1900-1904. 3. Fertilizers again used as in the first period.

In the following tables will be found the average returns per acre of the different crops grown, during each of these periods.

WHEAT.

No. of Plot.	Fertilizer applied during First and Third Periods.	Average First period 1888–1898 & 99. (Fertilizers.)		Average Second Period 1899–1904. (Clover Grown.)		Average Third Period 1905–1910. (Fertilizers.)	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Manure (rotted)	20	56	25	43	18	0
2	Manure (fresh).....................	23	52	27	11	14	0
3	Unmanured..........................	10	18	15	7	7	58
4	Mineral Phosphate..................	10	23	17	14	10	6
5	Phosphate, Nitrate of Soda.........	12	31	15	15	11	56
6	Manure, Phosphate	18	11	21	50	16	26
7	Phosphate, Nitrate of Soda, Wood ashes..........................	12	44	16	37	12	36
8	Phosphate, Wood ashes...	10	42	14	41	10	0
9	Superphosphate....	11	37	14	49	9	56
10	Superphosphate, Nitrate of Soda....	12	58	14	6	10	50
11	Superphosphate, Nitrate of Soda, Wood ashes.................... ...	13	56	15	31	12	12
12	Unmanured................	9	40	13	7	7	2
13	Bone............................. .	11	43	15	23	9	58
14	Bone, Wood ashes	15	9	16	28	13	28
15	Nitrate of Soda................ ..	13	18	16	53	11	18
16	Muriate of Potash	15	19	16	28	11	26
17	Sulphate of Ammonia....	12	5	15	25	10	8
18	Sulphate of Iron...	12	26	13	58	9	27
19	Salt.......	13	20	15	17	9	36
20	Gypsum..	12	30	13	50	9	58
21	Phosphate..........................	12	33	14	50	10	28

BARLEY.

1	Manure (rotted).	34	35	37	45	36	2
2	Manure (fresh):....................	35	21	36	3	39	14
3	Unmanured	13	30	17	26	14	14
4	Mineral Phosphate.	13	27	20	29	16	46
5	Phosphate, Nitrate of Soda.........	19	45	24	31	26	4
6	Manure, Phosphate......	28	5	30	36	33	4
7	Phosphate, Nitrate of Soda, Wood ashes..........................	23	34	33	33	32	28
8	Phosphate, Wood ashes..............	19	26	29	21	25	28
9	Superphosphate....	20	35	24	39	20	35
10	Superphosphate, Nitrate of Soda....	27	2	27	44	28	6
11	Superphosphate, Nitrate of Soda, Wood ashes	26	8	29	46	30	20
12	Unmanured..........................	13	1	17	30	13	12
13	Bone...............................	13	33	20	5	17	38
14	Bone, Wood ashes...................	22	19	28	17	26	16
15	Nitrate of Soda.....	21	37	22	20	20	16
16	Muriate of Potash.........	22	3	24	36	22	18
17	Sulphate of Ammonia................	18	11	22	3	17	42
18	Sulphate of Iron...................	17	34	21	39	19	18
19	Salt...............................	27	44	25	22	26	26
20	Gypsum	19	22	23	11	19	4
21	Mineral Phosphate..................	20	7	24	7	19	29

OATS.

No. of Plot.	Fertilizer applied during First and Third Periods.	Average First period 1888-1889 & 99. (Fertilizers.)		Average Second period 1899-1904. (Clover Grown.)		Average Third period 1905-1910. (Fertilizers.)	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Manure (rotted)	48	14	57	8	51	8
2	Manure (fresh)	54	17	57	26	49	26
3	Unmanured	30	20	44	6	26	12
4	Mineral Phosphate	30	23	47	3	35	24
5	Phosphate, Nitrate of Soda	48	21	51	2	41	2
6	Manure, Phosphate	44	59	56	26	43	16
7	Phosphate, Nitrate of Soda, Wood ashes	46	9	56	10	40	27
8	Phosphate, Wood ashes	40	8	54	5	34	33
9	Superphosphate	35	0	47	17	30	5
10	Superphosphate, Nitrate of Soda	46	21	49	7	38	14
11	Superphosphate, Nitrate of Soda, Wood ashes	36	4	45	3	28	6
12	Unmanured	21	9	29	23	15	32
13	Bone	33	25	39	20	27	26
14	Bone, Wood ashes	37	28	51	19	33	26
15	Nitrate of Soda	46	7	48	21	36	18
16	Muriate of Potash	34	24	52	3	36	30
17	Sulphate of Ammonia	43	21	51	0	42	28
18	Sulphate of Iron	35	13	48	26	37	18
19	Salt	35	5	48	31	38	8
20	Gypsum	32	24	42	6	35	8
21	Mineral Phosphate	33	6	43	29	35	28

INDIAN CORN

No. of Plot.	Fertilizer applied during First and Third Periods.	Average First Period 1888-1898 & 99. (Fertilizers.)				Average Second Period 1899-1904. (Clover Grown.)				Average Third Period 1904-1910. (Fertilizers.)			
		1st. Plot.		2nd. Plot.		1st. Plot.		2nd. Plot.		1st. Plot.		2nd. Plot.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Manure (rotted)	16	240	12	696	17	357	15	830	14	1266	11	1550
2	Manure (fresh)	17	724	11	785	13	742	12	195	12	1692	10	1862
3	Unmanured	7	323	5	410	7	706	6	493	2	1464	2	1747
4	Phosphate	6	1840	4	305	13	1647	10	1147	5	1830	5	728
5	Phosphate, Nitrate of Soda	10	932	8	1408	16	827	11	1260	8	1212	8	40
6	Manure, Phosphate	16	729	11	899	15	1770	14	103	11	1498	9	1974
7	Phosphate. Nitrate of Soda, Wood ashes	14	1347	10	1380	17	857	13	1780	10	1758	9	944
8	Phosphate, Wood ashes	11	279	8	456	16	1703	15	633	9	440	7	1658
9	Superphosphate	10	264	7	1309	16	733	13	1020	8	174	6	306
10	Superphosphate, Nitrate of Soda	12	1854	10	39	15	1883	13	13	7	1890	6	1308
11	Superphosphate, Nitrate of Soda, Wood ashes	15	944	11	1146	19	887	16	450	11	598	9	1066
12	Unmanured	10	202	8	500	14	1777	12	1717	6	1456	5	748
13	Bone	11	327	8	1115	16	1387	13	1447	7	1106	6	502
14	Bone, Wood ashes	11	1464	8	1497	17	1750	15	1067	9	1770	8	972
15	Nitrate of Soda	12	384	9	607	13	1960	11	977	7	1134	6	728
16	Sulphate of Ammonia	12	1009	9	1239	15	1060	12	980	7	1824	6	1888
17	Superphosphate, Muriate of Potash.	12	1297	8	1773	17	553	15	440	10	1102	8	974
18	Muriate of Potash	8	1138	5	1534	16	727	14	667	8	1072	7	628
19	Muriate of Potash, Blood, Superphosphate	11	458	7	1225	16	1993	15	583	10	726	9	8
20	Wood ashes	9	1016	6	1841	17	1223	15	233	9	792	8	368
21	Bone, Sulphate, Ammonia, Muriate of Potash	12	222	6	692	15	47	14	223	9	1642	7	146

MANGELS AND TURNIPS.

	Fertilizers applied during First and Third Period.	Average First Period 1888-1898 & 99. (Fertilizers.)				Average Second Period 1899-1904. (Clover grown.)				Average Third Period 1904-1910. (Fertilizers.)			
		Mangels.		Turnips.		Mangels.		Turnips.		Mangels.		Turnips.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Manure (rotted)	23	212	15	196	19	47	19	175	18	1202	9	314
2	Manure (fresh	22	269	15	854	17	700	18	862	19	1550	9	716
3	Unmanured	8	1587	6	1863	9	1787	11	293	5	1376	3	686
4	Phosphate	8	644	7	593	10	1753	13	1257	6	134	4	1160
5	Phosphate, Wood ashes, Nitrate of Soda	13	1732	9	1436	16	1480	13	1200	15	212	6	1804
6	Manure, Phosphate	18	859	13	514	15	1030	13	1357	15	108	7	1224
7	Phosphate, Nitrate of Soda, Muriate of Potash	10	1472	9	1012	14	1343	11	197	15	742	6	1300
8	Sulphate of Potash, Nitrate of Soda	13	1725	11	1730	13	1563	12	940	13	586	8	766
9	Superphosphate	9	120	8	1327	12	497	14	410	8	572	6	494
10	Nitrate of Soda	14	520	9	134	13	1467	12	1150	10	1646	7	488
11	Sulphate ammonia	10	145	10	667	12	603	13	1630	8	928	7	572
12	Unmanured	7	354	6	677	8	1213	10	1753	4	498	3	410
13	Bone	10	196	8	616	11	1613	13	10	9	1820	5	1712
14	Wood ashes	10	1508	7	1107	12	1047	13	380	9	608	4	1244
15	Salt	9	961	7	21	11	943	11	1677	7	1090	3	1110
16	Superphosphate, Nitrate of Soda	13	589	10	711	11	580	14	1717	8	990	7	756
17	Superphosphate, Wood ashes	12	985	9	31	16	1157	18	1963	9	1466	7	38
18	Superphosphate, Muriate of Potash	12	415	9	1900	15	680	18	537	12	1004	6	1204
19	Muriate of Potash, Blood, Superphosphate	13	1150	11	737	16	1257	17	1140	12	1802	6	1468
20	Ashes, Salt	14	202	10	183	18	223	16	773	13	146	5	154
21	Superphosphate	14	1190	10	903	15	990	16	1230	9	1936	5	692

REPORT OF EXPERIMENTS IN AGRICULTURE AND HORTICULTURE AT KAMLOOPS, B.C.

The following report under date of March 31, 1910, has been received from Mr. E. W. Calhoun, Superintendent of the Harper Ranch, Kamloops, B.C., on some experiments which are being conducted under the instructions of the Minister of Agriculture by the Director of Experimental Farms, on ten acres of land set aside for that purpose on the Harper Ranch.

Arrangements have been made for conducting, on this area, tests of winter wheat, spring wheat, rye, barley, oats, potatoes, &c. Furthermore, a portion has been set aside for experiments with apple trees. These tests have been arranged to ascertain the best methods of procedure in growing grain, &c., under dry-farming conditions, especially with a view of learning the advantages, if any, attending the use of certain implements known as soil packers:—

HARPER RANCH, KAMLOOPS, B.C.,
March 31, 1910.

To Dr. Wm. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit the following report of the work done on the ten acres of land retained for experimental purposes by the Dominion government on the Harper Ranch, Kamloops, B.C.

The ten acre plot of land referred to has been fenced with posts 20 feet apart and five wires. It was broken about four inches deep during the latter part of May last,

and, during the first two weeks in June, was disc harrowed twice each way and drag harrowed. It was backset about six inches deep the third week in June and drag harrowed several times at different intervals, so as to retain the moisture before seeding.

On the 31st of August, the following seeding was done:—

½ acre Winter Wheat, Turkey Red, at 1 bushel to the acre.
½ " " " 1 " "
½ " " " ½ " "

The Campbell packer was used on the two latter plots before seeding.

½ acre Winter Rye at 60 lbs. to the acre.

Packer used on this plot also.

This grain all came up nicely and looked promising before the winter set in, but, owing to there having been practically no snowfall during the winter, a condition which has been, I am sorry to say, universal throughout this section of the interior of British Columbia, you can understand that the grain has consequently been exposed to frost. While it may yet come out all right, the prospects are not very encouraging, whereas, if we had got the usual snowfall, the grain would not only have been protected from the frost, but, as the ground was so well cultivated, it would have retained a large percentage of the moisture from the melted snow which would have materially assisted growth in the early spring, so that the grain would have shaded the ground before the hot weather set in.

We shall sow the spring grain already received and the trees to be forwarded, as you may direct.

I have the honour to be, sir,
Your obedient servant,
E. W. CALHOUN

REPORT ON AGRICULTURAL AND HORTICULTURAL EXPERIMENTS ON THE WHITEFISH RIVER NEAR LAKE ABITIBI.

During the spring of 1909, arrangements were made with Mr. Frank Moberley to conduct some agricultural and horticultural experiments on his farm near Lake Abitibi, on the Whitefish River.

Five acres were placed at the disposal of the Experimental Farms for experimental purposes covering tests of the more important varieties of grain and other agricultural and horticultural products.

Mr. Moberley has submitted the following report, giving the results obtained from trial plots of various samples forwarded to him for test:—

BARRIE, ONTARIO, October 4, 1909.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I beg to make the following report of experiments in growing different grains, &c., at Whitefish River, 10 miles north of Lake Abitibi in the province of Quebec.

The different samples of grains and the trees and shrubs forwarded from the Experimental Farm all reached me at Matheson in good condition, except two or three of the ornamental shrubs and the gooseberries, which did not grow.

The opening of Lake Abitibi was very late and I did not arrive at Whitefish until the 29th of May and immediately set to work to get the ground in order and seeds in as soon as possible. There had been very little rain in May and the old ground was dried and so hard it was difficult to work. On June 1, I sowed White Fife wheat,

Thousand Dollar, Wide Awake and Ligowo oats, peas and flax, and on June 2, Stanley wheat, barley and rye (the latter did not come up). Also during these two days planted potatoes; sowed lettuce, radishes, carrots, beets, onions, salsify, peas and corn; from this time on until the 12th of July there was little rain, only in sprinkling showers which had no effect on the hard clay, so until the latter date the seed lay dormant. Besides being so dry the prevailing winds were from the north and west, which are cold quarters. From time to time as a little rain fell we sowed timothy and red clover, and although I was not able to carry out the seeding of these latter as extensively as intended owing to weather conditions, yet they proved the only satisfactory part of the whole operations. When growth really did commence the weather was so cold as to retard it very much, and as you will see by daily weather report, which I send herewith, the readings of the thermometer are very low and indicate frost on several occasions in July. August was more favourable in regard to weather until the 21st, when there was a frost which about put an end to most of the crop both in field and garden. After this date the weather was wet and cold so that no recovery was possible until I cut the grain on September 15. It had not filled out at all but was very light, but straw was of a good length.

The flax did fairly well, and if we had had an average season it would have been a good crop, and I have no doubt the other grains would have succeeded as well.

The timothy and red clover have both taken well, and I attach a photograph of a corner of the clover patch. I have left it to see how it will pull through the winter.

Some of the vegetables were still growing, such as carrots and salsify, but the peas, both field and garden, were a perfect failure; during the two previous seasons they were an abundant crop; lettuce and radishes were good, but everything else a failure, even artichokes.

The little apple trees that were sent up this season did very well, as did the ornamental shrubs. The apple trees that have been at Whitefish two years made a good growth, although they had been damaged a good deal by mice last winter, which also attacked the Quebec native plum trees and currant bushes, but both recovered. The potatoes would have been a good crop if they had had a chance to ripen. I planted Peck's Early and the American Wonder.

I am more than disappointed at results of the season's work, as I had fully counted on its being a success.

You will notice on daily weather record the prevalence of north winds.

I may say that, while the above were the conditions of Whitefish farm, 10 miles north of Lake Abitibi, at the Hudson Bay Company post on the lake shore, where a large field of potatoes was planted only a small shaded corner of the crop was touched by the August frost, and the balance was not touched when I left on September 21.

* I forwarded some specimens of the crop such as it was.

Enclosed are weather reports for June, July, August and part of September, and also some photographs taken at Whitefish farm, and I would call your attention particularly to the one of a corner of the clover patch.

I have the honour to be, sir,

Your obedient servant,

(Signed) FRANK MOBERLEY.

* The samples of grain received from Mr. Moberley were quite immature; the potatoes also were only about half-grown, whereas potatoes received later from the Hudson Bay Company's post referred to were of fairly good quality.

TABLE of meteorological observations taken at Whitefish, Pontiac county, near Lake Abitibi, Quebec, from June 1 to September 18, 1909, showing maximum, minimum and mean temperature; also highest and lowest for each month, with date of occurrence; also rainfall and number of days with precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°					
June	69·60	38·36	31·23	53·97	85·0	4th	25·0	19th	1·42	8	0·58	17th
July	72·19	45·67	26·51	58·92	86·0	9th	29·0	5th	3·38	14	1·00	30th
August	72·90	46·61	26·29	59·75	86·0	7th	27·0	21st	4·00	13	0·76	31st
September	60·27	37·11	23·16	48·69	82·0	14th	24·0	9th	2·83	13	0·95	15th
									11·68	48		

The report for September is not complete, as there are no returns after the 18th of the month.

REPORT OF MR. ROBERT JONES ON EXPERIMENTS IN AGRICULTURE AND HORTICULTURE AT FORT VERMILION, ALBERTA.

FORT VERMILION, ALBERTA, March 31, 1910.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit the second annual report of work done on the experimental station at Fort Vermilion on the Peace River, with remarks on the condition of farm work in general throughout this district in 1909.

The spring of 1909 was late and very slow in opening, and seeding was not general until May 15 and was not finished until May 28. Cold weather prevailed all through May and germination of the seeds sown was very slow. On the night of June 3 a frost occurred which cut down squash, melons, tomatoes and cucumbers, but after this, fine weather was general and continued throughout July, growth was very rapid and there was every prospect of an abundant harvest.

On the night of August 18 a frost occurred which damaged the wheat crops considerably, reducing the yield by about one-third. Other frosts occurred on August 22, 26, 27 and 28, but oats and barley were far enough advanced to escape injury, and are quite up to the usual standard.

Harvest was general on August 23, but stacking was hindered by continued wet weather in September.

Apart from the experimental plots on the station, wheat will not, probably, anywhere average more than 17 bushels to the acre.

As little threshing has yet been done it is difficult to estimate the total yield or the amount of damage done by frost.

Gardens in the district were above the usual standard. A great deal of interest has been aroused and much impetus given to private planting by the work done on the experimental station, which is very encouraging.

The fruit trees and ornamental shrubs have done well. Growth has not been quite so rapid as last year, but I think that the wood is well ripened and that they will be better prepared to endure the winter.

Roses were in bloom from the end of June until the frost came and were very pretty. All the flowers bloomed freely and were much admired by all who saw them.

Wild hay was very scarce on the prairies and high lands, but was abundant and of a good quality in the swamps and around the lakes.

EXPERIMENTS WITH SPRING WHEAT.

Date of sowing, in all varieties, May 15.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw, Per acre.	Yield per Acre.		Weight per Measured Bushel after cleaning.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Red Fife	Sept. 5	113	39-42	Stiff	3½	Bald	3,584	21	14	63½
Bishop	Aug. 31	108	39-42	"	4	"	3,920	28	0	63½
Early Riga	" 27	104	39-42	"	3	"	2,632	19	8	64
Preston	Sept. 1	109	48	Medium	5	Bearded	3,584	26	8	63¼
Ladoga	" 1	109	48	"	4	"	3,500	25	40	64½

EXPERIMENTS WITH BARLEY.

All sown May 22.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.	Lbs.	Bush.	Lbs.
Sidney (Two-rowed)	Aug. 27	97	38	Medium	3½	3,440	51	24
Canadian Thorpe (Two-rowed)	" 25	95	38	"	4	4,315	52	24
Claude (Six-rowed)	" 17	87	38	"	4	3.120	61	36
Mensury "	" 18	88	38	"	4	2,850	44	1

EXPERIMENTS WITH OATS.

Date of sowing, May 19, 1909.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw, per acre.	Yield per Acre.		Weight per Measured Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Tartar King	Aug. 27	100	34	Strong	10	Sided	6,069	55	17	36¼
Banner	" 27	100	34	Medium	9	Branching	4,998	72	17	35
Improved Ligowo	" 27	100	34	"	9	"	5,654	60	0	....

EXPERIMENTS WITH FIELD PEAS.

Name of Variety.	Date of Sowing.	Date when Cut.	Character of Straw.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.	
				In.	In.		Bush.	Lbs.
Arthur	May 17	Sept. 2	Strong	42	2½	Medium	22	24
*Golden Vine	" 19	" 18					..	..

* Very green when cut; will not be fit for seed.

INDIAN CORN.

Sown May 17 in one-twentieth acre plots.

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Condition when Cut.	Weight per acre grown in hills.	
	In.					Tons.	Lbs.
Longfellow	66	Very leafy	Aug. 22	Aug. 25	Green	8	1,745
Compton's Early	58	Leafy	" 26	" 26	"	6	1,728
Dakota White	50	"	" 24		"	5	1,440

SWEET CORN.

Pochahontas	38	Leafy	Aug. 10	Aug. 15	Fit for use Aug. 24.	
Hiawatha	38	"	" 12		Green	

Weights estimated after cured.

EXPERIMENTS WITH FIELD ROOTS.

Name of Variety.	Weight. Per acre.	
	Tons.	Lbs.
Turnips—		
Good Luck	17	464
Perfection Swede	15	1,416
Mangels—		
Prize Mammoth Long Red	14	480
Giant Yellow Intermediate	16	1,800
Sugar Beets—		
Vilmorin's Improved	12	1,600
Klein Wanzleben	11	984
Carrots—		
Improved Short White	18	950
Half-Long Chantenay	14	215

EXPERIMENTS WITH POTATOES.

Name of Variety.	Date of Planting.	Date of Digging.	Yield per acre.	Average size.	Form and Colour.
1 Everett	May 18	Sept. 15	412 bush.	Medium	Long, Pink.
2 Carman No. 1	"	"	401 bush. 42 lbs.	Large	Oval, White.
3 Early White Prize	"	"	384 bush. 32 lbs.	Medium	" "
4 Rochester Rose	"	"	370 bush. 48 lbs.	Large	Long, Red.
5 Burpee's Extra Early	"	"	343 bush. 20 lbs.	Large	Round, Pink.

ALFALFA.

Up to the present date, October 6, 1909, this is doing remarkably well. At the second cutting on August 10, I obtained about one ton from the various small plots. It remains now to be seen what will happen to it during our severe winter.

VEGETABLE GARDEN.

GARDEN PEAS.

'Gradus.'—These were sown on May 17, and were fit for use on July 19. The pods were long and well filled. The straw was 30 inches high and well loaded.

'Stratagem.'—This pea was also sown on May 17, but the seed had been attacked by insects, and very few of them germinated. Those that did germinate produced well and were fit for the table on July 20.

GARDEN BEANS.

'Improved Golden Wax.'—Sown on May 19 and were fit for table on August 1. The pods were about 5 inches long, and quickly ripened after becoming fit for table.

'Early Refugee.'—These were sown May 19 and were fairly vigorous in growth and very productive. The pods measured from 3 to 4 inches. They remained fit for table a long time.

BEETS.

'Market King.'—These were sown on May 20 and were ready for table July 26. Crisp and sweet and very good.

'Dwarf, Red, Bonsecour's Market.'—Also sown May 20. Fit for use July 26. Very good.

PARSNIPS.

'Hollow Crown.'—Sown May 20 and fit for use in August. A very strong grower and produced roots of large size.

SQUASH.

'Boston.'—Transplanted from hotbed on May 25, and did fairly well. From two plants I obtained five squash, which were cut in September, the largest of which weighed 6 lbs.

'Summer Golden Crockneck,' 'Hubbard.'—These were transplanted on the same date, but were killed by frost during summer, as were also muskmelon and cucumber.

PARSLEY.

'Extra Curled.'—This was sown on May 24 and was in use July 1. A good crop.

TABLE CARROTS.

'Early Horn.'—Sown on May 20 and fit for table on July 18. Crisp and sweet, and grew very large.

TABLE TURNIPS.

'Early White Stone.'—Sown on May 24 and were fit for use July 1. A very rapid grower and of fine flavour.

ONIONS.

'Danver's Yellow.'—Sown May 20. This variety grew well and were very large.

'Large Red Wethersfield.'—Sown same date. These were very large, solid and close grained. From the two small packages of seed sent I obtained 170 lbs.

LETTUCE.

'Paris Market.'—Sown May 20 and in use June 20. Very fine. At the end of August several head weighed as much as 1 lb. 2 ozs. each.

RADISH.

'French Breakfast.'—Sown May 20; ready for table June 19. Very fine indeed.

ASPARAGUS.

This was sown May 20 and did very well. I have about 105 good, strong plants, which have been transplanted into permanent beds and are doing well.

TOMATOES.

'Atlantic City.'—These were sown on May 6 in hotbed and transplanted into the open on May 22 and I obtained from 50 plants about 2 bushels of partly ripe fruit.

CABBAGES.

Two varieties were sown in hotbed on May 5 and were transplanted into the open on June 3. Both varieties did well, 'Early Jersey Wakefield' being ready July 30, and when pulled on September 10, many of them weighed 16 lbs. each. The other variety, 'Premium Large Flat Dutch,' were also up to the same state of perfection.

CAULIFLOWERS.

On the same date, May 5, one variety of cauliflower was sown in hotbed and transplanted on June 2. The variety was 'Early Snowball.' They did well and were fit for table on August 1. When pulled on September 10 some weighed as much as 11 lbs. each.

THE FLOWER GARDEN.

Name of Variety.	Set Out.	In Bloom From	In Bloom To	Remarks.
Verbena hybrida Mammoth	All sown in open ground from 22nd to 27th of May.			Did not germinate.
Antirrhinum, Tom Thumb		July 25th	Sept. 18th	Very fine.
Portulaca grandiflora		July 24th	Sept. 18th	do
Dianthus Chinensis diadematus		Aug. 5th	Sept. 18th	do
Poppy, "The Shirley"		July 18th	" "	do
Poppy "Snowdrift"				Destroyed by cutworms.
Poppy "Iceland"				do
Poppy "Californian"		July 14th	Sept. 18th	Very fine indeed.
Dianthus laciniatus		Aug. 1st	Sept. 18th	do
Godetia		July 24th	Sept. 18th	Good.
Balsam Camelia-flowered				Cut down by frost.
Gaillardia picta Lorenziana		July 30th	Sept. 18th	Very fine.
Nasturtium Tall Royal Exhib. Strain		July 2nd	Sept. 18th	do
Nasturtium Tom Thumb		July 2nd	Sept. 18th	do
Antirrhinum, Choice Striped		Aug. 20th	Sept. 18th	do
Phlox Drummondii Grandiflora		July 20th	Oct. 6	
Pansy, Large flowering select		July 11st	Sept. 18th	do
Clarkia, mixed		July 1st	Sept. 18th	do
Stocks, German Tenweek		Aug. 4th	Sept. 18th	do
Coreopsis Drummondii		July 15th	Sept. 18th	Bloomed freely.
Candytuft, Empress		July 9th	Oct. 6	Extra fine.
Mignonette	All sown in open ground.	July 15th	Oct. 6	Very good.
Scabiosa, dwarf double		Aug. 1st	Sept. 18th	Bloomed freely.
Aster, Queen of the Market		Aug. 18th	Sept. 18th	Large flowers.
" Victoria		Aug. 30th	Sept. 18th	Very nice.
" Giant Comet		" 30th	Sept. 18th	Good.
Sweet Peas, 8 varieties		July 14th	Sept. 18th	Large flowers in profusion.

RECORD of Sunshine at Fort Vermilion, Peace River District, Alberta, from April 1, 1909, to March 31, 1910.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	30	0	245.6	8·13
May	31	0	257.1	8·29
June	28	2	333.3	11·11
July	29	2	313.7	10·11
August	30	1	276.6	8·92
September	25	5	188.7	6·29
October	24	7	109.2	3·52
November	21	9	80.6	2·68
December	25	6	96.1	3·10
January	15	16	51.0	1·64
February	26	2	157.2	5·61
March	26	5	144.2	4·65

I have the honour to be, sir,

Your obedient servant,

ROBT. JONES.

TABLE of Meteorological Observations taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1909, to March 31, 1910, showing maximum, minimum, and mean temperature, also highest and lowest for each month with date of occurrence; also rainfall, snowfall, and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°							
April	31·72	6·06	25·66	18·89	48·7	9th	—28·2	12th	0·38	1·00	0·72	4	0·38	9th.
May	58·49	34·93	23·55	46·70	83·4	27th	14·7	1st	2·11	....	2·11	10	0·71	21st.
June	72·59	42.64	29·95	57·61	97·7	14th	30·2	1st	1·27	....	1·27	5	0·92	17th.
July	73·66	48·40	25·26	61·03	81·5	6th	34·4	1st	2·96	....	2·96	9	0·98	5th.
August	68·30	42·83	25·47	55·56	84·0	13th	30·2	18th	1·80	....	1·80	9	0·60	20th.
September	60·29	37·28	23·00	48·78	75·0	25th	22·0	22nd	1·30	....	1·30	7	0·50	8th.
October	41·46	27·15	14·30	34·30	64·0	4th	11·8	11th	0·31	0·25	0·33	5	0·17	17th.
November	11·73	— 9·13	20·86	1·30	45·0	3rd & 5th	—35 0	20th	....	1·75	0·17	4	0·05	9th.
December	7·83	—17·06	24·90	—4·61	37·0	16th	—46·0	2nd	....	0·50	0·05	1	0 05	12th.
January	10·37	—15·42	25·80	—2·52	34·2	31st	—32·0	17th	....	2·50	0·24	4	0·07	14th & 30th.
February	9 05	—24·93	33·98	—7·94	38·2	7th	—43·2	23rd	....	1·25	0·12	2	0·10	26th.
March	31·88	2·70	29·18	17·29	61·5	15th	—39·9	6th	....	5·00	0·50	5	0·20	28th.
	....	....	....	....	....	....	....	....	10·13	12·25	11·57	65	....	....

Some Weather Observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River District, Alberta.

—	Mean Temp.	Highest Temp.	Lowest Temp.	Total Precipitation.	Heaviest in 24 hours.	Total Hours Sunshine.	Average Sunshine per day.
	April.						
	°	°	°				
Ottawa	37·46	64·0	14·5	3·71	0·83	172·7	5·75
Fort Vermilion	18·89	48·7	28·2	0·72	0·38	245·6	8·18
	May.						
Ottawa	53·59	75·5	30·5	5·84	1·34	195·5	6·30
Fort Vermilion	46·70	83·4	14·7	2·11	0·71	257·1	8·29
	June.						
Ottawa	65·68	91·8	39·9	2·52	0·83	255·0	8·50
Fort Vermilion	57·61	97·7	30·2	1·27	0·92	333·3	11·11
	July.						
Ottawa	67·16	89·8	47·0	4·69	1·09	236·9	7·64
Fort Vermilion	61·03	81·5	34·4	2·96	0·98	313·7	10·11
	August.						
Ottawa	67·97	95·6	42·0	3·11	1·25	279·7	9·02
Fort Vermilion	55·56	84·0	30·2	1·80	0·60	276·6	8·92
	September.						
Ottawa	57·84	84·8	36·6	2·81	0·59	190·6	6·35
Fort Vermilion	48·78	75·0	22·0	1·30	0·50	188·7	6·29
	October.						
Ottawa	45·24	76·8	21·8	1·11	0·35	134·8	4·34
Fort Vermilion	34·30	64·0	11·8	0·33	0·17	109·2	3·52
	November.						
Ottawa	35·64	63·6	6·0	3·18	1·10	87·9	2·93
Fort Vermilion	1·30	45·0	—35·0	0·17	0·05	80·6	2·68
	December.						
Ottawa	18·89	36·0	— 8·8	1·50	0·65	59·4	1·91
Fort Vermilion	— 4·61	37·0	—46·0	0·05	0·05	96·1	3·10
	January.						
Ottawa	17·90	41·0	—18·5	2·30	0·70	88·8	2·86
Fort Vermilion	— 2·52	34·2	—32·0	0·24	0·07	51·0	1·64
	February.						
Ottawa	12·88	43·4	—19·4	2·30	0·70	124·1	4·43
Fort Vermilion	— 7·94	38·2	—43·2	0·12	0·10	157·2	5·61
	March.						
Ottawa	33·59	72·6	— 3·3	1·44	0·44	214·8	6·92
Fort Vermilion	17·29	61·5	—39·9	0·50	0·20	144·2	4·65

WILLIAM T. ELLIS.

RESULTS OF EXPERIMENTS IN TREE PLANTING ON SABLE ISLAND.

In May, 1901, at the request of the Department of Marine and Fisheries, I conducted some experiments in tree planting on Sable Island. This is a lonely island which lies in the Atlantic Ocean about 153 miles northeast of Halifax. Owing to strong ocean currents and almost perpetual winds, this island is being gradualy reduced in size. Early surveys showed that it was almost 40 miles long, whereas its present length is about 21 miles. The gradual wasting of the island has led to the consideration of the possibility of establishing tree growth there so that the land might become more fixed and further lessening of the surface retarded if not prevented.

Selections of a number of varieties of the hardiest trees obtainable were made and shipped to Halifax. This shipment comprised, in all, 81,345 trees and shrubs, 68,755 of evergreens of 25 varieties, with 12,590 of deciduous sorts of 79 varieties.

With this shipment, we left Halifax in the government steamer *Minto,* on the afternoon of the 15th of May, 1901, and arrived at Sable Island on the morning of the 16th. A full account of the objects of this expedition, with details of the work undertaken, was published in the annual report of the Experimental Farms for 1901, p. 62, to which the reader is referred for full particulars.

After about ten days spent in planting and planning the work, its completion was left with the Superintendent of the Island, Mr. R. J. Boutellier, who carefully carried out the instructions given and completed the work on June 17. Letters were received from him in July, August and November of that year.

At first, the results of the work seemed fairly encouraging, but a severe drought, which lasted from August 13 to October 3, 1901, killed a large number of the trees, and the high winds which blew almost a continuous gale carried with them sharp particles of sand which bruised and destroyed the leaves of most of the deciduous things so that, after making two or three efforts to put out new foliage, and each time having it ground off by the cutting, drifting sand, most of them perished.

On May 26, 1902, a careful memorandum was prepared by Mr. Boutellier, giving the condition of the surviving trees, shrubs, &c., also of some further experiments in tree growing from seed; a list of the species which had survived was also given which, under date of July 21, 1902, showed a large proportion of loss. No reference has since been made to the results of this experiment, in the annual reports of the Experimental Farms.

During the month of October, 1909, I had a very pleasant visit in Ottawa from Mr. Boutellier, the Superintendent of Sable Island, when we discussed the condition of the remnants of the trees which had survived the constant grind of wind and sandstorm for eight years. He promised, on his return, to make a very careful examination and to send me an account of the condition of all the surviving trees. He returned to the island on November 17 and wrote me on March 23, 1910, as follows:—

'On January 25 and 26 I visited No. 4 Station at the east end of the Island and examined the plot carefully in which about 2,000 trees and shrubs were planted. I found the following alive as nearly as I could identify them. They were all spread out on the ground and were about one foot high. In summer, they run up to the top of the rank grass that grows around them, perhaps quite two feet. I succeeded in making out the following trees:—

15 Austrian Pine—*Pinus Laricio nigricans.*

5 Mountain Pine—*Pinus montana.*

16 Scotch Pine—*Pinus sylvestris.*

12 Maritime Pine—*Pinus pinaster* = *Pinus maritimus,* five of which grew from seed.

2 Norway Spruce—*Abies excelsa.*

1 Black Spruce—*Abies nigra.*

At No. 3 Station, I found planted in a small enclosure, about 15 feet square, and boarded up 5 feet high, specimens of Matrimony vine, *Lycium Europæum*. One root had been planted and it had spread over half the space in the enclosure and was a little lower than the top of the fence. This was quite luxuriant in growth and shoots were up through the sod several feet from the parent bush.

At the plantation known as Gourdeau Park where the larger part of the trees were put—a large basin-like depression which afforded some shelter from the wind—nothing now remains except a few specimens of Scotch Broom, *Genista scoparia*, scarcely existing, about the size of the original plants.

In the little garden at the main station, which is somewhat sheltered, the following were found:—

1 Weigelia—*Diervilla rosea.*

3 Van Houtte's Spiræa—*Spiræa Van Houttei.*

8 Red Currants. These have produced small quantities of fruit.

3 Lilacs grown from seed. *Syringa vulgaris.*

3 Gooseberries. Have produced small quantities of fruit.

2 Blackberries. Have never fruited.

3 Raspberries. Produced a handful of fruit one year.

1 Pine, probably *Pinus Cembra*, about two feet broad and six inches high.

1 Japanese Rose, *Rosa rugosa;* grows profusely, never kills back; about 5 feet high.

1 American Elm; less than two feet high.

1 Manitoba Maple; less than two feet high. These grow up rapidly during the summer and kill back during winter.

In this garden spot, there is also a strawberry patch from the plants supplied in 1901, which yields good fruit and some years in abundance.

These are all the specimens alive from the planting of 1901, and, excepting the *Rosa rugosa* and *Lycium Europæum*, none of them can be said to be thrifty. In the planting of these trees, I have taken much interest and I had hoped that some of them might succeed, and I exceedingly regret that I have to make such an unfavourable report.'

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

The first visit paid in 1909 to the Branch Experimental Farms was in June, when I left Ottawa on the 5th and went direct to Rosthern, Sask. There, arrangements were made for fencing the new Experimental Farm and the necessary implements and tools were obtained, suitable horses purchased, and a building for the superintendent contracted for. As this farm was in rather a weedy condition, most of the land was summer-fallowed to clean it. The planting of the farm, comprising shelter belts, orchards, &c., was early considered, quite a large collection of hardy trees and shrubs had been accumulated and preparations were made for carrying on a full line of experiments with grain and other crops.

Lacombe, Alta., was also visited at this time and the plots and fields of grain duly inspected. The grounds were very much beautified by the large additions made to the clumps and groups of hardy trees planted here. The crops were all looking well and the surroundings of this farm were very attractive.

Lethbridge, Alta., was next visited and a careful inspection made of the many crops under test, both irrigated and non-irrigated, a large proportion of which were looking remarkably well. The fields of alfalfa were green and luxuriant and the trees and many of the small fruits were very promising.

From June 20 to 22 were spent at Agassiz, B.C., which was during the season of cherries. They were just ripe, but the heavy rains which prevailed at the time

caused the fruit to swell and crack so that it was impossible to gather them in a marketable condition. The crops generally, especially the grain and root plots, were all looking well and the grounds were gay with roses, rhododendrons, azaleas and other choice flowers.

On the return journey, Indian Head, Sask., was visited June 29 and 30, and the crops found in excellent order. The fields of grain were very luxuriant and the growth at this time was very rapid and full of promise. The large groups of flourishing shrubs at this farm were very attractive, especially the lilacs, honeysuckles and caraganas.

The Experimental Farm for Manitoba at Brandon was visited on July 1 and 2, and, on a careful inspection, all the crops were found to be in a promising condition. The four-acre field of Marquis wheat, which at harvest time gave an average yield of fifty-two bushels to the acre, was a splendid example of spring wheat. The stock and horses at both the above farms were found to be in good condition.

Early in August, a visit was paid to the Experimental Farm for the Maritime Provinces, at Nappan, N.S., and the crops were found in good condition. The hay crop had yielded well. A visit was also paid at this time to the new Experimental Farm at Charlottetown, P.E.I., and a considerable amount of work planned.

The general condition of the crops, buildings, implements, horses and other stock at each of these several farms was most gratifying and reflected credit on the management.

MEETINGS AND CONVENTIONS ATTENDED.

On August 23, I left Ottawa for Winnipeg, where I attended the meetings of the British Association for the Advancement of Science. These were held from August 25 to Sept 2. The meetings were large and well attended, many distinguished men being present from foreign countries. A paper was presented by me during this meeting on the Development of the Dominion Experimental Farms, which appears in the pages of this report. At the close of this convention, I joined the excursion to Victoria and took charge of one of the Pullman cars, in which were the president and some other distinguished visitors, and travelled with them from Winnipeg to the coast to give information regarding the country and its agricultural possibilities.

I also attended the annual meeting of the American Association for the Advancement of Science, which was held in Boston from December 25 to January 2. This meeting afforded an opportunity of gaining much information with reference to scientific matters generally and especially in their bearing on agricultural progress. Many meetings were held daily until the adjournment on January 2.

On January 22, I visited Rochester, N.Y., to attend the annual meeting of the Western New York Horticultural Society where, in response to invitation, I addressed them, on January 26, on the subject of Agricultural Progress in the Canadian Northwest. The facts submitted were widely circulated through the press and thus closer attention was called to the great possibilities for further advances in agriculture in Canada.

ACKNOWLEDGMENTS.

I beg to acknowledge my indebtedness to all the members of the Experimental Farm staff for their kind co-operation in the various branches of work conducted at the Central Experimental Farm and at the Branch Farms throughout the Dominion. The present report gives evidence of their earnest efforts to render service to agriculture in their various spheres of labour.

Pæonies at Central Experimental Farm, Ottawa.

Photo by C. E. Saunders.

I also tender sincere thanks to those members of the staff who have aided me in those branches of the work of which I have had personal charge; to the farm foreman for his careful supervision of the special tests of fertilizers on field crops and the records of the results taken; to the foreman of the distribution branch for his watchful care over the distribution of the samples of seed grain sent for trial to farmers in all parts of the Dominion; to the foreman in charge of the lawns and ornamental grounds at the Central Farm, for the taste and industry he has displayed, and to the foreman of the greenhouses for his careful management of the plants and shrubs under propagation, also for the useful work he has done in testing the vitality of seeds and in the taking of meteorological records. I desire also to bear testimony to the faithful service of my secretary. The employees also of all the farms have my thanks for the interest they have manifested in their work and the careful manner in which they have discharged their respective duties.

REPORT OF

THE DOMINION AGRICULTURIST

J. H. GRISDALE, B. AGR.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

I have to report a very successful year in the different lines of work in my division.

Weather conditions in 1909 were probably quite up to the average as favouring crop production in this part of Canada. The reports of the different fields show the beneficial effects of such fairly favourable weather in increasing crop returns as compared with the years 1906, 1907 and 1908.

The work in my division was, as usual, carried on with the efficient co-operation of the farm foreman, Mr. D. D. Gray, and the herdsman, Mr. Wm. Gibson. Mr. Meilleur continues to do good work in the dairy. In correspondence and clerical work I am indebted to Mr. L. Giguere for careful and intelligent co-operation.

During the year I have attended a large number of meetings in various parts of Canada in addition to my regular duties on the Central Experimental Farm.

From April 1, 1909, to March 31, 1910, 3,551 letters were received and 6,026 despatched by the Agricultural Division.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,

Dominion Agriculturist.

LIVE STOCK.

The live stock now (April 1, 1910) occupying the different stables and pens under my charge include horses, cattle, sheep and swine.

HORSES.

The horses are kept for labour exclusively, although some experimental feeding is usually under way to gain some information as to the most economical methods of feeding work horses, as well as experiments to determine the comparative values of different foods as forage for same.

The horses are usually nineteen in number, made up of:—

Thirteen heavy horses of Clydesdale and Percheron blood

Five heavy driving horses.

One light driver.

CATTLE.

There are representatives of four breeds of cattle, viz.: Shorthorn, Ayrshire, Guernsey and Canadian. There are besides a number of grade cattle and steers. The cattle are kept for breeding and feeding operations, mostly of an experimental character. Pure-bred breeding animals are usually on sale, however, and a considerable number are sold in the course of the year.

PURE-BRED BREEDING CATTLE.

The pure-bred cattle in the barn at present are as follows:—

Twenty-six Shorthorns, including 3 bulls and 23 females.

Twenty-nine Ayrshires, including 1 bull and 28 females.

Eighteen Guernseys, including 3 bulls and 15 females.

Twenty-nine Canadians, including 6 bulls and 23 females.

GRADE CATTLE.

At present the grades number 19 head, made up of 3 Shorthorn grades, 5 Ayrshire grades, 6 Guernsey grades and 5 Canadian grades.

STEERS.

Twenty-two steers are under feed at present. They are of different ages and breeding, and the number is made up of 9 yearlings and 13 calves.

SHEEP.

Sheep are not kept in large numbers, only 62 being now in the pens. Two breeds are kept, namely: Shropshire and Leicester.

There are 38 Shropshires, as follows: One aged ram, 8 ram lambs, 20 aged ewes and 9 ewe lambs.

There are 8 Leicesters, as follows: Seven ewes and one ram.

Besides the above pure-breds there were 16 grade wethers.

SWINE.

Sixty-five swine of all classes are now in the pens, being fed experimentally, or being kept for breeding purposes. The breeds kept are Berkshire, Yorkshire and Tamworth.

The Yorkshires are 37 in number, including 2 stock boars, 29 breeding sows and 6 young pigs.

The Berkshires are 12 in number, including stock boar, 9 breeding sows and 2 young pigs.

The Tamworths are 13, including 1 stock boar, 9 breeding sows and 3 young pigs.

Three cross-bred barrows.

HORSES.

There are usually 19 horses in the stables. These horses are expected to do the work in the various divisions during the year. The work on the '200-acre farm' is but a part of their duties. They work in addition for the horticultural and cereal divisions, as well as upon lawns and in the arboretum. In addition, a large amount of hauling or cartage in connection with the different divisions, as well as road making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year, from April 1, 1909, to March 31, 1910, the work done by the 19 horses kept in the stables here was equivalent to 5,604·4 days' work, distributed as follows: Live stock, hauling feed, marketing stock, &c., 131·2 days; farm work, '200-acre farm,' 776·3 days; draining and care of roads, including removing snow and breaking roads in winter, 155·3 days; manure on '200-acre farm,' 322·7 days; horticultural division, 718 days; lawns, &c., 171·3 days; cereal division, 574·4 days; bulletins and reports, from and to farm offices, 140·1 days; poultry, 44·5; mail, including milk delivery, 99·1 days; omnibus service, including one horse for omnibus, two horses for general driving and horse for supervision of work, 1,650 days; work about green house, outbuildings, sidewalks, exhibitions, &c., 821·5 days.

In estimating the cost of farming operations further on in this report, $3 a day is charged for team and driver. To feed and care for the horses cost about 35 cents per horse per working day, and the driver receives an average of about $1.75 per 10-hour day. It is evident, therefore, that the team and driver costs about $2.45 per day, leaving a margin of 55 cents or 27·5 cents per horse per day for wear and tear.

THE STABLES.

The horse barn, built in 1906, and of which a description appears in the report for 1907-08, has proven very satisfactory.

Of the two systems of ventilation installed and possible of operation therein, 'The King' and 'The Rutherford,' the latter has proven to be much the more efficient and sanitary. With three inlets and two outlets this system keeps the air constantly renewed and in good condition without lowering the temperature beyond the point of comfort. The walls and ceilings have never shown any signs of dampness, hence the opinion that it is more sanitary. It has been found, however, that it is necessary to control the air currents at the points of intake rather than at the outlets if best results are to be hoped for.

The abundance of light has proven apparently very acceptable and beneficial.

The feeding chutes, after three years' trial, are still in use and are much liked by the men doing the actual feeding.

The cement floors, looked upon with suspicion by many horsemen when first laid, have been found safe, hygienic and durable. No injury has been traceable, directly or indirectly, to these floors although in use for three years. The stable can be kept absolutely free from unpleasant odours, an impossibility where wooden floors are used. The stalls, although showing some wear in certain cases, appear to be quite remarkably durable and will probably last a good number of years.

FEEDING THE WORK HORSES.

The horses here are fed by one man. Each teamster is responsible for the cleaning of his horses and harness, but has nothing to do with the feed.

Generally speaking, the horses are fed on mixed hay, given long, oats and bran, about 5 parts of whole oats to 2 parts of bran. These two are mixed and fed dry. On Saturday nights a bran mash of 5 or 6 lbs. per horse takes the place of the regular oat and bran mixture. When horses are on very heavy work, the ratio between oats and bran is usually changed to 5 of oats and 1 of bran. The horses receive from 1 to 1¼ lbs. of the oat and bran mixture and about 1 lb. of hay a day for each 100 lbs. of their weight. That is to say, a 1,600-lb. horse would get from 16 to 20 lbs. of grain mixture and about 16 lbs. of hay each day. The amount of grain or grain mixture fed depends upon the work being performed. The harder the work, the larger the amount of meal fed. That is, of course, subject to change, according to the health of the animals and various other minor considerations, such as degree of fatigue at night, temperature, &c.

The feeding of the horses follows regular lines and is done at regular hours. The first feed for the day is given about 5 a.m. It consists of about three-eighths of the total amount of meal or grain mixture to be fed during the day and about one-quarter of the hay. The noon feed is about the same thing. The evening feed consists of about one-quarter or two-eighths of the meal or grain mixture for the day and about one-half the hay.

Water is given between 6 and 7 in the morning, at noon, at 6 o'clock, or as the horses come in from work, and in winter at about 8 p.m. The water is given at 8 o'clock at night in the winter for the reason that the horses come in an hour earlier at night and go out an hour later in the morning.

EXPERIMENTS IN HORSE FEEDING.

Each year more or less experimental work is carried on in horse feeding. During the winter, 1909-10, some work was carried on to determine, if possible, whether it was safe and possible to substitute corn or barley for oats in feeding working horses.

The following tables show the results obtained:—

LOT 1.—FOUR HORSES ON MIXTURE, BARLEY 5 PARTS, BRAN 2 PARTS.

Name of horse.	Ration.	First weight Dec. 8, 1909.	Amount of grain consumed.	Weight, Dec. 21, 1909.	Amount of grain consumed.	Weight, Jan. 4, 1910.	Amount of grain consumed.	Weight, Jan. 18, 1910.	Amount of grain consumed.	Last weight, Feb. 1, 1910.	Gain or loss per horse in 8 weeks.	Amount of grain mixture consumed in 8 wks.
Tom........	Barley, 5 and Bran, 2	1,605	160	1,620	160	1,620	163	1,615	168	1,595	L. 10	651
Barney..........	"	1,330	159	1,295	148	1,300	161	1,330	168	1,330	Nil	636
Frank...........	"	1,525	Sick	1,505	160	1,520	163	1,540	168	1,490	L. 35	491
Britt............	"	1,635	159	1,635	135	1,640	148	1,625	168	1,620	L. 15	610
Aggregate.......	"	6,095	478	6,055	603	6,080	635	6,110	672	6,035	L. 60	2.388
Average per horse	"	1,523¾	119½	1,513¾	150¾	1,020	158¾	1,527½	168	1,508¾	L. 15	597

LOT 2.—FOUR HORSES ON MIXTURE, CORN 5 PARTS, BRAN 2 PARTS.

Name of horse.	Ration.	First weight Dec. 8, 1909.	Amount of grain consumed.	Weight, Dec. 21, 1909.	Amount of grain consumed.	Weight, Jan. 4, 1910.	Amount of grain consumed.	Weight, Jan. 18, 1910.	Amount of grain consumed.	Last weight, Feb. 1, 1910.	Gain or loss per horse in 8 weeks.	Amount of grain mixture consumed in 8 wks.
Ned.......	Corn, 5 and Bran, 2	1,555	166	1,555	160	1,550	167	1,545	200	1,540	L. 15	693
Bob.............	"	1,560	150	1,570	160	1,560	167	1,555	186	1,540	L. 20	663
Frank...........	"	1,370	161	1,365	160	1,380	165	1,350	186	1.395	G. 25	654
Doll.	"	1,480	139	1,470	133	1,470	145	1,425	167	1,435	L. 45	584
Aggregate	"	5,965	616	5,955	613	5,960	644	5,875	721	5,910	L. 55	2,594
Average per horse	"	1,491¼	154	1,488¾	153¼	1,490	161	1,468¾	180¼	1,477½	L. 13¾	648½

LOT 3.—FOUR HORSES ON MIXTURE, OATS 5 PARTS, BRAN 2 PARTS.

Name of horse.	Ration.	First weight Dec. 8, 1909.	Amount of grain consumed.	Weight, Dec. 21, 1909.	Amount of grain consumed.	Weight, Jan. 4, 1910.	Amount of grain consumed.	Weight, Jan. 18, 1910.	Amount of grain consumed.	Last weight, Feb. 1, 1910.	Gain or loss per horse in 8 weeks.	Amount of grain mixture consumed in 8 wks.
Star	Oats, 5 and Bran, 2	1,380	199	1,375	163	1,365	165	1,375	168	1.380	——	695
Dan....	"	1.350	199	1,340	163	1,360	165	1,375	168	1,580	G. 30	695
Frank...........	"	1,500	221	1,540	193	1,560	202	1.590	201	1.600	G. 100	817
Pete	"	1,540	218	1,555	193	1,570	202	1.590	201	1.585	G. 45	814
Aggregate......	"	5,770	837	5.810	712	5,855	734	5.930	738	5,945	175	3,021
Average per horse	"	1,442½	209¼	1.452½	178	1,463¾	182½	1,482½	184½	1,486¼	43¾	755¼

From a study of the above experimental data, it would appear that corn and barley could be substituted for oats, but the horses did not like either one as well as oats. The barley-fed horses seemed to really dislike the barley, more particularly at first, and one of them was off feed for a few days apparently for no other reason than a dislike of his grain ration.

DAIRY CATTLE.

The herd of dairy cattle during the year 1909-10 consisted of 65 milch cows all told. They were:—

Ayrshires	14
Guernseys	9
Canadians	16
Shorthorns	12
Grades (various breeding)	14

FEEDING THE DAIRY COWS.

The year 1909-10 has been a fairly satisfactory year from the dairy farmers' point of view. In this district, grass was exceedingly slow in starting, but growth was luxuriant once the weather became favourable. The months of August and early September were, as usual, dry and forage was rather short, but later conditions were exceedingly favourable.

SUMMER FEEDING.

As during the previous three years, the dairy cattle were allowed only a small area for pasture. They depended very largely upon soiling crops and corn silage.

A regular succession of crops was planned to supply the necessary forage.

A fourteen-acre field was available for pasture for 50 head. This field had been seeded down the previous year with the following mixture of seed per acre: Red clover, 5 lbs.; alfalfa, 7 lbs.; timothy, 10 lbs.

This seeding made such a strong growth in late May and early June that it was decided to divide the field, pasture the cattle on one-half and cut the other part for soiling purposes. This proved to be a very satisfactory plan and enabled us to materially increase the carrying power of the field.

For August, provision had been made by holding over a supply of corn ensilage. This material was fed more or less every day during the summer. During August, however, it formed the staple part of the ration. In September, grass was again plentiful, so very materially lessened the quantity of forage required to supplement the grass.

Practically all farmers require more or less feed to supplement pasture grass, unless the area down to grass is, relative to the number of cattle, very large. Corn silage is, no doubt, for most parts of Canada, the best forage to use for such a purpose.

In many cases, however, silos are not yet in use, and for such farmers a good plan would be to make use of the information contained in a 'Notice' or leaflet of instruction sent out very largely from this division the last few years, a copy of which appears below.

NOTICE FROM THE EXPERIMENTAL FARM TO DAIRY FARMERS.

Every year every dairy farmer loses much money on account of the scarcity of grass or by reason of the unprofitably large area of land that has to be used to insure good pasture during the months of July and August.

If the aveage dairy herd is to be profitable, every cow must be kept up to her full capacity during those two months, as well as during the preceding and succeeding months.

Clover Crop—Central Experimental Farm.

Photo by F. T. Shutt.

16—p. 64

The quantity of milk produced during September, October and November is very materially influenced by the way in which the cattle are fed in July and August.

Cows receiving insufficient food during those two months naturally decrease very rapidly in milk flow. Once the milk yield is materially decreased for any considerable length of time, it cannot during that season be again brought up to what it might otherwise have been.

Hence, although pastures are usually good or feed plentiful during the months of September, October and November, when prices for cheese and butter are high, we must, in order to get the full benefit of these high prices and abundant supplies of feed, have been feeding well during the months of July and August.

The cheapest, easiest and most certain plan of insuring an abundance of food during the months of July and August is to make use of soiling crops.

Experiments at the Experimental Farm as well as elsewhere would seem to indicate vetches, peas, oats, clover and corn as the most suitable crops for the purpose.

For 10 Cows.

Dairy farmers are, therefore, recommended to prepare and feed somewhat as follows for each 10 cows in their herds:—

1. Clover, 1 acre—To have been sown with the mixture of peas and oats the previous year as described below.

Feed off June 20 to July 15.

2. Peas and oats, ½ acre—Sow 1 bushel peas, 1½ bushel oats and 5 lbs. red clover seed on one-half acre of land about the first week in May, or earlier if possible.

Feed off July 15 to 31.

3. Peas and oats, ½ acre—Sow same mixture on another half acre about third week in May.

Feed off August 1 to 15.

4. Corn, ½ acre.—Sow 10 lbs. Longfellow corn (or other small variety in hills 3 feet apart each way. Sow third week in May or as early as possible. Sow on well drained land, clover sod manured at rate of 20 loads (tons) per acre.

Feed off August 15 to 30.

5. Corn, ½ acre.—Sow 12 lbs. Leaming (or other medium variety) same way as above.

Feed off in September.

WM. SAUNDERS,
Director.

J. H. GRISDALE,
Agriculturist.

WINTER FEEDING.

The winter feeding was carried on under quite as favourable conditions as the summer. Feed was plentiful and of good quality. Cattle entered the barns in good flesh and have done well.

The winter ration has been on the average about as follows:—

Hay	5 lbs.
Corn ensilage	30 lbs.
Roots	15 lbs.
Straw	4 lbs.
Meal	7 lbs.

The hay was mixed red clover and timothy. The corn silage was of good quality, rich in grain and well preserved.

The roots were mangels, sugar mangels, sugar beets and turnips. They were usually pulped and mixed with the ensilage.

The straw was, of course, oat, and was of good feeding quality. It was cut and mixed with the pulped roots and ensilage.

The meal usually consisted of a mixture of 800 lbs. bran, 300 lbs. gluten and 200 lbs. oil-cake meal.

The meal was scattered on the roughage mixture of roots, ensilage and cut straw after it was before the cattle. The hay given was fed uncut, after the other material had been cleaned up.

Of course the amount of roughage fed depends on the appetite of the cow; the amount of meal is influenced rather by the amount of milk being produced by the cow in question.

Her meal ration is gradually increased after calving, until at three or four weeks in milk she is supposed to be on full feed. The amount of meal is judged by the milk produced. If she responds freely to the increases in meal, she is fed the more liberally, usually up to that point where an increase in meal does not seem to induce a relatively liberal increase in milk flow. One pound of meal for four pounds of milk is liberal feeding; one pound of meal for three pounds of milk, to leave a profit, necessitates selling milk at a higher price than the average farmer may hope for. In this connection it may be observed that the quality or composition of the meal ration is usually an important factor affecting the milk yield. It is exceedingly important, however, to remember that palatability in the meal as well as in the roughage is an influence that is not infrequently underestimated. Variety in meals fed is advisable, but variety should mean a blending of meals, not a substitution of one for another at frequent intervals. To illustrate, it is much better to feed a mixture of bran, oats, barley, oil-meal, gluten, cottonseed meal, &c., than to feed any one of them for a time, to be subsequently replaced by some other.

Generally speaking, the meal ration for dairy cows should be rich in protein, palatable, easily digested and fairly finely ground and blended to suit the roughage ration with which it is fed. Meals vary greatly as to composition and effect upon the digestive organs of the cattle. While some are laxative, some are constipating in effect, and while some seem to develop appetite, others have the opposite tendency.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during the season 1909, save in the case of ensilage and roots, which are charged for at the rate usually affixed in the experimental feeding in all parts of America.

Pasture per month	$ 1 00	per cow
Bran	20 00	per ton
Gluten meal	28 00	per ton
Oil meal	35 00	"
Oats	25 00	"
Barley	22 00	"
Clover hay	7 00	"
Chaff	4 00	"
Roots and ensilage	2 00	"

In estimating the value of the product, 26 cents per pound is allowed for the butter and 20 cents per 100 lbs. for the skim milk. The butter sells at from 25 to 35 cents per pound.

DAIRY HERD RECORDS.

The Central Experimental Farm dairy herd records as given below make a moderate showing. Where cattle are soiled, the cost of feeding during the summer months is of course increased, since more labour is necessary.

A study of the records shows a small number of cows that failed to pay for their feed. These, for the most part, are being disposed of to the butcher. Two or three of them are, however, being held over since they show promise of ultimately becoming profitable cows or made the bad showing on account of some accidental circumstance for which they could not be justly held responsible.

Names of Cows.		Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield in milk.	Total milk for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per pound.	Value of skim milk at 20 cents per cwt.	Total value of product.	Amount of meal eaten at 1¼ cent per lb.	Amount of roots, ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw eaten valued at 20c. per cwt.	Months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. of butter, skim milk neglected.	Profit on cow during period, labour neglected.
		Yrs.			Lbs.	Lbs.	p. c.	Lbs.	$	$	$	Lbs.	Lbs.	Lbs.	Lbs.	Mos.	$	Cts.	Cts.	Cts.	
Marjorie	A.	8	Feb. 20, '10.	283	32·4	9,169	4·0	438·9	114·11	17·46	131·57	2,921	17,346	3,258	372	4	68·53	74·0	15·6	10·4	63·04
Queonie	G.G.	12	Jan. 23, '09.	359	16·9	6,050	6·1	434·61	113·00	11·23	124·23	2,715	15,861	4,589	372	4	62·23	102·0	14·3	11·7	62·00
Zamora	C.	14	″ 17, '10.	334	23·6	7,873	4·6	431·64	112·23	14·88	127·11	2,827	15,813	3,300	372	4	65·98	83·0	15·2	10·8	61·13
Inoquette	C.	6	Mar. 17, '09.	365	20·6	7,524	4·5	390·56	101·54	14·27	115·81	2,703	15,271	2,252	372	4	60·30	80·0	15·4	10·6	55·49
Denty	A.	11	″ 13, '09.	334	25·8	8,635	3·9	395·74	101·89	16·48	118·37	2,619	16,310	3,195	372	4	63·66	73·0	16·0	10·0	54·71
La Belle	C.	5	″ 17, '10.	319	21·9	6,998	4·7	390·20	101·45	13·22	114·67	2,666	15,861	3,260	372	4	63·99	91·0	16·4	9·6	50·68
Dolly	G.A.	7	″ 30, '10.	306	27·2	8,324	3·6	355·10	92·33	15·93	108·26	2,566	16,382	2,596	372	4	60·99	73·0	17·1	8·9	47·27
Maggie of C.	A.	2	May 2, '09.	304	28·2	8,600	3·7	373·34	97·06	16·45	113·51	2,913	17,131	3,198	342	4	67·95	79·0	18·2	7·8	45·56
Duchess 2eme.	C.	5	Mar. 26, '09.	365	16·4	5,980	5·2	369·95	96·19	11·22	107·41	2,641	15,675	3,230	372	4	63·40	106·0	17·1	8·8	44·01
Flavia	A.	8	May 13, '09.	298	25·4	5,579	3·8	339·91	88·37	14.47	102·84	2,484	16,260	2,644	372	4	60·05	79·0	17·6	8·4	42·79
Ottawa Itchen	G.	4	Oct. 30, '09.	304	26·0	6,279	4·7	353·08	91·80	11·85	103·65	2,891	15,930	2,581	372	4	64·49	102·0	18·2	7·8	39·16
Flavia II	A.	4	″ 28, '09.	276	26·3	7,277	3·8	326·85	84·98	13·09	98·88	2,754	16,029	2,586	341	4	62·84	86·0	19·2	6·8	36·04
Deanie	G.	11	Aug. 9, '09.	262	22·2	5,832	4·6	317·17	82·20	11·03	93·23	2,386	15,770	2,441	372	4	57·68	98·0	18·2	7·8	35·55
Whitie	S.G.	6	Mar. 12, '10.	293	24·3	7,123	3·8	321·33	83·54	13·60	97·14	2,603	17,286	2,848	372	4	63·21	88·0	19·6	6·4	33·93
Illuminata III.	S.	6	Oct. 18, '09.	288	27·6	7,935	3·7	345·15	89·74	13·18	102·92	3,057	18,292	2,802	372	4	69·51	88·0	20·1	5·9	33·41
Alma II	G.G.	4	Sept. 30, '09.	304	18·4	5,607	4·8	320·01	83·20	10·57	93·77	2,623	15,640	2,600	372	4	60·96	108·0	19·0	7·0	32·81
Dora	G.G.	7	May 30, '09.	245	19·4	4,752	5·2	290·56	75·55	8·92	84·47	1,888	15,381	2,605	372	4	51·89	109·0	17·8	8·2	32·58
Marjorie II.	A.	4	July 24, '09.	330	20·3	6,711	4·1	326·70	84·94	12·07	97·71	2,725	16,412	3,235	372	4	65·17	97·0	19·2	6·1	32·54
Ott. Marchioness III.	S.	4	Apl. 1, '09.	365	17·7	6,460	4·1	315·34	81·99	12·29	94·28	2,548	16,921	2,767	372	4	61·91	95·0	18·6	6·4	32·37
Dona Clatina	G.	3	Sept. 6, '09.	181	27·0	3,755	4·8	212·89	55·35	7·08	62·43	1,483	9,220	941	1	....	30·31	80·0	14·2	11·8	32·12
Fortune	C.	13	Apl. 29, '09.	327	19·6	6,411	4·2	319·53	83·08	12·18	95·26	2,605	15,844	3,260	372	4	63·24	98·0	19·7	6·3	32·02
Denty III	A.	4	″ 4, '09.	296	23·4	6,934	3·8	311·20	80·91	13·25	94·16	2,701	16,247	3,211	372	4	64·63	93·0	20·7	5·3	29·53
Molly	S.	8	Feb. 10, '10.	309	23·0	7,117	3·7	311·66	81·03	13·61	94·64	2,741	17,755	2,781	370	4	65·11	91·0	20·9	4·1	29·53
Kate	A.	3	Oct. 4, '09.	178	25·1	4,478	3·8	204·56	53·18	8·54	61·72	2,649	9,399	929	....	....	32·44	72·0	15·8	10·2	29·28
Alma	G.G.	9	July 24, '09.	272	20·0	5,441	4·5	286·59	74·51	10·31	84·82	2,027	16,466	3,170	371	4	56·61	104·0	19·7	6·3	28·21
Précoce	C.	3	Jan. 24, '09.	365	13·9	5,091	4·7	283·69	73·81	9·61	83·42	2,308	15,279	2,493	372	4	56·43	110·0	19·8	6·2	26·99
Gurta	A.	9	Feb. 1, '09.	365	15·1	5,515	4·0	263·20	68·33	10·50	78·93	2,163	14,232	2,479	372	4	53·60	97·0	20·3	5·7	25·35
Maggie V	A.	4	May 5, '09.	323	18·9	6,115	4·0	287·76	74·82	11·65	86·47	2,533	15,799	3,139	372	4	61·90	101·0	21·5	4·5	24·57
Soncy R.	A.	5	....	182	18·8	3,433	4·0	163·94	41·62	6·54	49·16	1,056	9,691	940	....	..	25·65	74·0	15·6	10·4	23·51
Fanny	G.C.	5	Feb. 5, '10.	318	16·1	5,147	4·5	274·48	71·36	9·74	81·10	2,376	16,360	2,549	372	4	58·53	113·0	21·3	4·7	22·57
Itchen Lady	G.	12	Jan. 1, '10.	270	24·6	6,656	4·3	340·79	68·61	12·63	81·24	2,440	15,755	2,711	372	4	59·24	89·0	17·4	8·6	22·00
Duchess of V	S.	5	Feb. 26 '10.	275	22·5	6,205	3·9	288·42	74·88	11·83	86·71	2,711	17,783	2,763	372	4	64·71	104·0	22·4	3·6	21·90

Denty III	A.	5	May 13, '09.	312	18·0	5,624	4·2	281·81	73·27	10·68	83·95	2,507	16,270	3,209	372	4	62·32	118·0	22·1	3·9	21·57
Pearly Prize.........	G.	5	Feb. 10, '10.	263	18·1	4,761	4·7	264·89	68·87	8·99	77·86	2,304	15,680	2,745	372	4	57·67	120·0	21·7	4·3	20·19
Illuminata V.........	S.	3	Oct. 15, '09.	182	22·2	4,052	3·6	173·43	45·09	7·55	52·84	1,581	11,477	1,097	....	....	34·28	84·0	19·7	6·3	18·56
Rejane	C.	6	" 22, '09.	283	16·7	4,742	4·8	270·44	70·31	8·94	79·25	2,591	15,418	2,700	372	4	60·71	121·0	24·4	3·6	18·54
Duchesse.............	C.	6	Apl. 15, '09.	271	22·0	5,978	3·8	262·34	68·21	11·43	79·64	2,447	15,891	3,270	372	4	61·43	102·0	23·4	2·6	18·21
Poupée...............	C.	7	Feb. 2, '09.	275	19·8	5,447	4·1	265·16	68·94	10·36	79·30	2,456	15,776	3,400	372	4	61·88	114·0	23·3	2·7	17·42
Duchesse Perdue	C.	4	May 8, '09.	304	14·9	4,525	4·1	219·98	57·19	8·61	65·80	1,951	12,732	2,377	112	4	48·68	107·0	22·1	3·9	17·12
Janet................	S.	10	Mar. 24, '10.	235	22·6	5,323	4·0	254·07	66·05	10·13	76·18	2,292	17,233	2,780	372	4	59·20	111·0	23·3	2·7	16·98
Ottawa Spot.........	G.	5	Jan. 14, '09.	183	19·7	3,613	4·3	186·87	45·58	6·85	52·43	1,678	6,510	1,410	372	4	36·23	100·0	19·3	6·7	16·20
Aromaz............	C.	3	" 4, '10.	82	23·0	1,890	4·6	104·30	27·12	3·57	30·69	718	5,010	419	....	....	15·09	79·0	14·4	11·6	15·60
Bessie.............	G.A.	3	Sept. 7, '09	181	16·0	2,908	3·7	128·28	33·35	5·56	38·91	968	9,361	947	....	....	24·28	86·0	18·8	7·2	14·63
Duchesse V.........	C.	3	Oct. 2, '09.	298	18·0	5,370	4·0	254·20	66·09	10·23	76·32	2,700	15,453	2,700	372	4	62·05	115·0	24·4	1·6	14·27
Jessie D	A.	4	May 21, '09.	319	14·8	4,752	3·9	221·98	57·70	9·06	66·76	2,022	13,686	3,035	100	4	52·76	111·0	23·7	2·3	14·00
Soncy...............	A.	4	Mar. 28, '10.	306	19·0	5,795	3·6	242·75	63·11	11·10	74·21	2,471	16,172	3,204	372	4	61·77	106·0	25·4	·6	22·44
Ottawa Lass	S.	8	Feb. 12, '10.	257	20·0	5,163	3·6	220·36	57·29	9·89	67·18	1,957	17,316	2,747	372	4	55·14	106·0	25·0	1·0	12·04
Inoquette III.	C.	2	Jan. 8, '10.	77	22·2	1,714	4·0	86·66	20·97	3·26	24·23	609	3,875	367	....	....	12·46	72·0	18·4	7·6	11·77
Ruby	G.	12	Feb. 4, '10.	266	17·8	4,740	4·2	234·27	60·91	9·01	69·92	2,308	16,472	2,745	372	4	58·50	123·0	24·9	1·1	11·42
Deanie II...........	G.G.	2	Nov. 30, '09.	120	16·6	1,998	4·1	97·41	25·33	3·80	29·13	857	5,905	562	....	..	18·15	90·0	18·6	7·4	10·98
Jessie E.............	A.	9	Jan. 30, '09.	365	13·6	4,948	3·7	211·15	54·90	9·47	64·37	2,239	13,542	2,479	372	4	53·82	108·0	25·0	1·0	10·55
Fortune 4eme.......	C.	3	Feb. 15, '10.	317	15·0	4,758	4·0	226·73	58·94	9·06	68·00	2,407	15,488	2,503	372	4	57·82	121·0	25·5	·5	10·18
La Belle II.........	C.	2	Oct. 17, '09.	160	11·2	1,800	4·5	96·76	25·16	3·40	28·56	749	8,101	821	....	....	19·96	110·0	20·6	5·4	8·60
Ott. Marchioness II..	S.	5	Dec. 14, '09.	288	17·2	4,955	4·1	243·43	63·29	9·42	72·71	2,664	17,859	2,851	372	4	64·52	130·0	26·5	*·5	9·19
Illuminata IV.......	S.	4	Jan. 26, '09.	306	15·6	4,783	3·9	222·54	57·86	9·12	66·98	2,391	17,466	2,856	372	4	60·88	127·0	27·3	*1·3	6·10
Pearl's Redemption..	G.	5	" 15, '10.	222	15·4	3,412	5·0	202·16	52·56	6·42	58·98	2,092	15,352	2,745	372	4	54·79	160·0	27·1	*1·1	4·19
Robichaud.........	C.	2	Feb. 20, '09.	334	11·6	3,900	4·0	187·74	48·81	7·42	56·23	2,102	14,107	2,479	372	4	52·73	135·0	28·0	*2·0	3·50
Ottawa Marchioness..	S.	7	May 23, '09.	304	13·2	4,032	4·0	192·19	49·96	7·67	57·63	1,951	17,165	2,767	372	4	54·99	136·0	28·6	*2·6	2·64
Queenie II..........	G.G.	2	Apl. 29, '09.	304	9·0	2,755	4·9	160·77	41·80	5·19	46·99	1,586	12,399	2,529	100	4	44·48	161·0	27·6	*1·6	2·51
Eva.................	G.C.	7	Aug. 10, '09.	224	14·0	3,155	4·3	161·12	41·89	5·99	47·88	1,755	12,683	2,214	372	4	46·23	146·0	28·6	*2·6	1·65
Jessica II..........	S.	9	May 4, '09.	355	11·2	3,985	3·9	185·15	48·14	7·60	55·74	2,190	15,121	2,563	372	4	55·11	138·0	29·7	*3·7	·63
Pearl...............	G.	9	Sept. 30, '09.	299	10·8	3,190	5·2	197·40	51·32	5·99	57·31	2,539	15,893	2,601	372	4	60·21	188·0	30·5	*4·5	*2·90
Molly II...........	S.	8	Feb. 10, '10.	237	12·7	3,026	4·2	150·85	39·22	5·75	44·97	2,068	17,690	2,707	372	4	56·71	187·0	37·5	*11·5	*11·74
Dora II............	G.G.	..	Mar. 13, '10.	228	9·2	2,111	5·2	129·77	33·74	3·96	37·70	1,877	14,740	2,595	372	4	51·09	242·0	39·3	*13·3	*13·39
Zaza...............	C.	4	Oct. 2, '09.	172	12·0	2,071	4·5	110·03	28·61	3·92	32·53	1,848	13,013	2,462	372	4	48·55	234·0	44·1	*18·1	*16·02

* Loss.

CANADIANS.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daly average yield in milk.	Total number for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per pound.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten at 1¼ cent per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw eaten at 20 cents per cwt.	Total cost of feed for period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on one pound butter, skim milk neglected.	Profit on cow during period, labour neglected.
Zanora	14	Jan. 17, '10.	334	23·6	7,873	4·6	431·64	112·23	14·98	127·11	2,827	15,813	3,300	372	65·98	83·0	15·2	10·8	61·13
Inquette	6	Mar. 17, '09.	365	20·6	7,524	4·5	390·56	101·51	14·27	115·81	2,703	15,271	2,252	372	60·30	80·0	15·4	10·6	55·49
LaBelle	5	" 17, '10.	319	21·9	6,998	4·7	390·20	101·45	13·22	114·67	2,666	15,861	3,260	372	63·99	92·0	16·4	9·6	50·63
Average	8		339	21·7	7,465	4·6	404·13	105·07	14·16	117·53	2,732	15,648	2,937	372	63·42	84·6	15·6	10·3	55·73

GRADES.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daly average yield in milk.	Total number for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per pound.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten at 1¼ cent per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw eaten at 20 cents per cwt.	Total cost of feed for period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on one pound butter, skim milk neglected.	Profit on cow during period, labour neglected.
Queenie	12	Jan. 23, '09.	359	16·9	6,050	6·1	434·61	113·00	11·23	124·23	2,715	15,861	2,589	372	62·23	102·0	14·3	11·7	62·00
Dolly	7	Mar. 31, '10.	306	27·2	8,324	3·6	355·10	92·33	15·93	108·26	2,566	16,382	2,596	372	60·99	73·0	17·1	8·9	47·27
Whitie	6	" 12, '10.	293	24·3	7,123	3·8	321·33	83·54	13·60	97·14	2,603	17,281	2,848	372	63·21	88·0	19·6	6·4	33·93
Average	8		319	22·8	7,165	4·5	370·31	96·29	13·58	109·87	2,628	16,508	2,644	372	65·47	87·6	17·0	9·0	47·73

SHORTHORNS.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daly average yield in milk.	Total number for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 26 cents per pound.	Value of skim milk at 20 cents per 100 lbs.	Total value of product.	Amount of meal eaten at 1¼ cent per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Amount of straw eaten at 20 cents per cwt.	Total cost of feed for period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on one pound butter, skim milk neglected.	Profit on cow during period, labour neglected.
Illuminata III	6	Oct. 18, '09.	288	27·6	7,935	3·7	315·15	89·74	13·18	102·92	3,057	18,292	2,802	372	69·51	88·0	20·1	5·9	33·41
Ottawa Marchioness III	4	Apl. 1, '09.	365	17·7	6,460	4·1	315·34	81·99	12·29	94·28	2,548	16,921	2,767	372	61·91	95·0	19·6	6·4	32·37
Molly	8	Feb. 10, '10.	309	23·0	7,117	3·7	311·66	81·03	12·61	94·64	2,741	17,755	2,781	370	65·11	91·0	20·9	5·1	29·53
Average	6		320·6	22·7	7,170	3·8	324·05	84·25	13·02	97·28	2,782	17,656	2,783	371	65·51	91·3	20·6	5·8	31·77

AYRSHIRES.

Marjorie	8	Feb. 20, '10.	283	32·4	9,169	4·0	458·09	114·11	17·46	131·57	2,921	17,346	3,258	372	68·53	74·0	15·6	10·4	63·04
Denty	11	Mar. 13, '09.	334	25·8	8,635	3·9	395·74	101·89	16·48	118·37	2,619	16,310	3,195	372	63·66	73·0	16·0	10·0	54·71
Maggie of C.	12	" 2, '09.	304	28·2	8,600	3·7	373·34	97·06	16·45	113·51	2,913	17,131	3,198	342	67·95	79·0	18·2	7·8	45·56
Average	10		307	28·8	8,801	3·8	402·39	104·35	16·79	121·15	2,817	16,929	3,217	361	66·71	75·3	16·[illegible]	9·4	54·43

GUERNSEYS.

Ottawa Itchen	4	Oct. 30, '09.	301	26·0	6,279	4·7	353·08	91·80	11·85	103·65	2,891	15,930	2,581	372	64·49	102·0	18·2	7·8	39·16
Deanie	11	Aug. 9, '09.	262	22·2	5,832	4·6	317·17	82·20	11·03	93·23	2,386	15,770	2,441	372	57·68	98·0	18·2	7·8	35·55
Dona Clatina	3	Sept. 6, '09.	181	27·0	3,755	4·8	212·89	57·35	7·08	62·43	1,483	9,220	941	–	30·31	80·0	14·2	11·8	32·12
Average	6		249	25·0	5,288	4·7	294·38	77·11	9·98	86·43	2,253	10,306	1,987	248	50·82	93·3	16·8	9·1	35·63

DAIRY COW RECORDS.

KEEPING RECORDS.

An increasingly large number of dairy farmers avail themselves of the offer made by this division to supply, free of cost, forms whereon to keep record of the milk produced each day, or one day in each week, by each cow. This fact points to progress along right lines. It is only when one knows the individuals in one's herd that one can hope to improve the general quality of the herd.

The forms supplied are for week-long periods, as illustrated below, or for month-long periods, as may be preferred by the dairymen. In addition, forms for summarizing the month's work, as well as forms whereon to enter up the year's record, are sent on application.

DAILY MILK RECORD.

Herd belonging to.. (This form supplied free by Live Stock
Post office .... Division, Central Experimental
Record for week ending.................................... Farm, Ottawa, Ont.)

COWS.

Day.	Time.																	Total for day.
Sunday..........	Morning.....																	
	Evening.....																	
Monday..........	Morning.....																	
	Evening.....																	
Tuesday..........	Morning.....																	
	Evening.....																	
Wednesday.....	Morning.....																	
	Evening.....																	
Thursday........	Morning.....																	
	Evening.....																	
Friday..........	Morning.....																	
	Evening.....																	
Saturday..........	Morning.....																	
	Evening.....																	
Total.........	Week.........																	

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

Wm. Saunders, Director. J. H. Grisdale, Live Stock and Agriculture

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow, her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk record of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms, write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the

thing a trial, if you are a dairyman? It will increase your milk product. It will lighten your labour since your interest will be increased in your work and 'interest lightens labour.' It will show you the unprofitable cow, the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple spring balance may be secured for from one and a half to four dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing to J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

DAIRY COW FEEDING EXPERIMENTS.

All cattle in the barns are under experiment to a greater or lesser extent. All cattle are not necessarily in comparative tests, but a record is kept of the methods of feeding and of quantities given each animal. Results are noted and conclusions drawn as to the values of different methods of feeding and different rations under certain conditions. Information gained in this way is difficult to disseminate directly, but is of great value as facilitating more intelligent handling of the live stock generally and the more efficient conducting of comparative feeding tests.

During the year two small experiments in comparative feeding have been conducted. In one case a test was made with three small groups of grade cows, far advanced in the lactation period, to gain some information as to the possibility of replacing the meal ration or some part thereof with mangels.

The second case was an experiment with five groups of cows, all far advanced in lactation, to gain, if possible, some information as to the comparative value of bran, alfalfa hay, dried beet pulp, beet and molasses meal or pulp, and an equal weight of a meal mixture made up of bran, 300 lbs.; shorts, 300 lbs.; gluten feed, 500 lbs., and peas, 100 lbs.

MANGELS VS. MEAL.

In this experiment the outline of the whole thing was as follows:—

First period, February 15-21, 1910.

Lot 1.—Alma, Fannie, Gurta.

Daily ration per cow.—Meal mixture, 1 lb. for each 3 lbs. milk produced; long straw, 3 lbs.; sorghum ensilage, 100 lbs.; cut straw, 16 lbs. What each cow would eat up clean.

Lot 2.—Sonoie, Bessie, Jessie E.

Daily ration per cow.—Same as Lot 1.

Lot 3.—Queenie, Robichaud, La Belle.

Daily ration per cow.—Same as Lot 1.

Second period, February 22-March 7, 1910.

Lot. 1. Daily ration per cow.—Same as period 1.

Lot 2. Daily ration per cow.—Roughage, same as period 1; mangels, 3 lbs. for each pound milk produced; no meal.

Lot 3. Daily ration per cow.—February 22-28, roughage, same as period 1; meal, 1 lb. to 4 lbs. milk produced; mangels, ½ lb. to 1 lb. milk produced. March 1-7, meal, 1 lb. to 5 lbs. milk produced; mangels, 1 lb. to 1 lb. milk produced.

Third period, March 1-8, 1910.

Lot 1. Daily ration per cow.—Roughage, same as period 1; mangels, 3 lbs. to 1 lb. milk produced.

Lot 2. Daily ration per cow.—Same as period 1.

Lot 3. Daily ration per cow.—March 8-14, roughage, same as period 1; meal, 1 lb. to 6 lbs. milk produced; mangels, 1½ lb. to 1 lb. milk produced. March 15-21, Meal, 1 lb. to 7 lbs. milk produced; mangels, 2 lbs. to 1 lb. milk produced.

Meal mixture.—Bran, 500 lbs.; beet pulp, 200 lbs.; beet and molasses pulp, 200 lbs.; cottonseed meal, 100 lbs.

Cows weighed.—Monday, February 14, 10 a.m.; Tuesday, March 22, 10 a.m.

All feeds weighed closely for each cow each time fed.

The data given below are not of very great value, but should prove useful as a guide to future work and as an indication of the danger of depending too much on roots for cows far advanced in lactation.

DAIRY COW EXPERIMENT.

1909-10.	First Period of One Week.			Second Period of Two Weeks.			Third Period of Two Weeks.		
	All Groups Fed Alike.			All Groups Fed Alike.			All Groups Fed Alike.		
	Lot 1.	Lot 2.	Lot 3.	Lot 1.	Lot 2.	Lot 3.	Lot 1.	Lot 2.	Lot 3.
Number of cows in group	3	3	3	3	3	3	3	3	3
Average weight to start	1,007	766	699	1,012	764	811	1,015	743	813
Average weight at end of period	1,012	764	811	1,015	743	813	1,010	777	812
Loss − or gain +	+5	−2	+12	+3	−21	+2	−5	+34	−1
Meal fed group in 1 day	17·2	16·4	9·2	16·8	9	5·4	....	11·7	2·6
Sorghum ensilage fed group in 1 day { Sorghum, 100 lbs. / Cut straw, 16 " }	129	119	114	130·3	64·3	120	76·3	110	120
Roots fed group in 1 day	....	....	....	....	118·6	6	126	....	28·2
Long straw fed group in 1 day	9	9	9	9	9	9	9	9	9
Meal fed group during period	120·7	115·2	64·2	236	....	75·4	....	164·7	37·5
Sorghum ensilage fed group during period { Sorghum, 100 lbs. / Cut straw, 16 " }	900	830	795	1,825	901	1,680	1,070	1,540	1,680
Roots fed group during period	....	....	....	....	1,661	84	1,765	....	395
Long straw fed group during period	63	63	63	126	126	126	126	126	126
Value of feed fed group during period ... $	2·78	2·57	1·91	5·54	2·82	3·28	3·25	4·25	3·08
Value of feed fed 1 cow in 1 day ... c.	13·2	12·3	9·1	13·2	6·7	7·5	7·7	10·1	7·3
Milk produced by group during period ... lbs.	363	328	180	699	515	290	579	503	212
First week's milk from group ... "	....	....	....	351	277	153	312	247	118
Last week's milk from group ... "	....	....	....	348	238	137	267	256	94
Average daily yield of milk of group during 1st week	52·5	47	25·7	50	39·6	21·9	44·5	35·3	16·9
Average daily yield of milk of group during 2nd week	....	....	....	49·7	34	19·6	38·1	36·5	13·4
Decrease in rate of daily milk yield	....	....	....	·3	5·6	2·3	6·4	1·2	3·5
Decrease in quantity of milk produced by group from period 1 to last week in period 3	....	....	....	....	....	....	96	72	86
Rate per cent of decrease in 4 weeks ... p. c.	....	....	....	....	....	....	26	22	48

MIXED MEAL VS. DRIED BEET PULP.—BEET AND MOLASSES MEAL VS. ALFALFA HAY.—ALFALFA HAY VS. DRIED BEET PULP.—MIXED MEAL VS. BEET AND MOLASSES MEAL.

This experiment, undertaken in order to compare dried beet pulp, beet and molasses meal and alfalfa hay with wheat bran or mixed meal, the feeding qualities of the bran and mixed meal being known, is not conclusive, but seems to demonstrate the great value of wheat bran and mixed meal as compared with the other feeds under trial as concentrates.

Alfalfa shows up rather badly in comparison with the dried beet pulp and the beet and molasses meal. This is, however, due in some measure to the rather poor quality of alfalfa hay available during part of the experiment.

In this experiment, the outline of the whole thing was as follows:—

Lot 1.—Main row, Shorthorns (7.)

First period, four weeks—

Ensilage, straw, etc. .. .. What they will eat.
Hay.. .. .. 4 lbs. each.
Mangels.. .. .. 8 lbs. each.
Meal.. .. .. 2 lbs. each and 1 lb. for each 4 lbs. milk produced.
Dried beet pulp.. .. .. 3 lbs.

Second period, four weeks—

Substitute 3 lbs. extra meal in place of dried beet pulp.

Lot 2.—Main row, Ayrshires (7.)

First period, four weeks—

Ensilage, straw, etc. .. .. What they will eat.
Hay.. .. .. 4 lbs. each.
Mangels.. .. .. 8 lbs. each.
Meal.. .. .. 2 lbs. each, then 1 lb. for each 4 lbs. milk produced.
Beet and Molasses meal.. .. .. .. 3 lbs.

Second period, four weeks—

Substitute 3 lbs. alfalfa hay in place of beet and molasses meal.

Lot 3.—Main row, Guernseys (5.)

First period, four weeks—

Ensilage, straw, etc. .. .. What they will eat.
Hay.. .. .. 4 lbs. each.
Mangels.. .. .. 8 lbs. each.
Meal.. .. .. 2 lbs. each, then 1 lb. for each 4 lbs. milk produced.
Wheat bran.. .. .. 3 lbs.

Second period, four weeks—

Same as first period.

Lot 4.—Main row, Canadians (9.)

First period, four weeks—

Ensilage, straw, etc.	What they will eat.
Hay	4 lbs. each.
Mangels	8 lbs. each.
Meal	2 lbs. each, then 1 lb. for each 4 lbs. milk produced
Alfalfa hay	3 lbs. each.

Second period, four weeks—

Substitute 3 lbs. dried beet pulp in place of alfalfa hay.

Lot 5.—Small row, Ayrshires, Guernseys Facing (9.)

First period, four weeks—

Ensilage, straw, etc.	What they will eat.
Hay	4 lbs. each.
Mangels	8 lbs each.
Meal	2 lbs. each per diem, and 1 lb. for each 4 lbs. milk produced. Regular meal mixture. 3 lbs. extra meal.

Second period, four weeks—

Substitute 3 lbs. beet and molasses meal in place of extra meal.

Meal Mixture.

Bran	300 lbs.
Shorts	300 "
Gluten feed	500 "
Peas	100 "

All feed weighed to groups. Started December 15.

The following table includes the more important data gathered from the work during the eight weeks the experiment lasted:—

EXPERIMENT WITH DIFFERENT CONCENTRATES FOR DAIRY COWS.

Group.		Group I.	Group I.	Group II.	Group II.	Group III.	Group III.	Group IV.	Group IV.	Group V.	Group V.
Period.		First Period of 28 days.	Second Period of 28 days.	First Period of 28 days.	Second Period of 28 days.	First Period of 28 days.	Second Period of 28 days.	First Period of 28 days.	Second Period of 28 days.	First Period of 28 days.	Second Period of 28 days.
Special Feed Fed.		Dried Beet Pulp.	Extra Meal.	Beet Molasses Meal	Alfalfa.	Bran.	Bran.	Alfalfa.	Dried Beet Pulp.	Extra Meal.	Beet Molasses Meal
Number in group		7	7	7	7	5	5	9	9	6	6
Average weight to start	Lbs.	1,292	1,342	1,066	1,083	952	954	964	1,005	859	858
Average weight at end of 4 weeks	"	1,342	1,395	1,083	1,110	954	1,002	1,005	1,051	858	878
Loss – or gain +	"	+ 50	+ 53	+ 17	+ 27	+ 2	+ 48	+ 41	+ 46	– 1	+ 20
Meal fed group in 1 day	"	38·26	30·6	37·34	35·3	27·7	24·3	43·9	46·2	42·5	39·5
Ensilage fed group in 1 day	"	502	394	369	367	242	236	402	414	297	279
Hay fed group in 1 day	"	28	28	28	28	20	20	36	36	24	24
Roots fed group in 1 day	"	56	56	56	56	40	40	72	72	48	48
Dried Beet Pulp fed group in 1 day	"	21	....	....	....	....	....	....	27	....	....
Beet and Molasses Meal fed group in 1 day	"	....	....	21	....	....	....	....	....	....	18
Bran fed group in 1 day	"	....	....	....	....	15	15	....	....	....	....
Alfalfa fed group in 1 day	"	....	....	....	21	....	....	27	....	....	....
Extra meal fed group in 1 day	"	....	21	....	....	....	....	....	....	18	....
Meal fed group in 4 weeks	"	1,071	858	1,046	991	777	682	1,230	1,295	1,191	1,107
Ensilage fed group in 4 weeks	"	14,068	11,025	10,325	10,285	6,780	6,615	11,277	11,592	8,316	7,812
Hay fed group in 4 weeks	"	784	784	784	784	560	560	1,008	1,008	642	672
Roots fed group in 4 weeks	"	1,568	1,568	1,565	1,568	1,120	1,120	2,016	2,016	1,344	1,344
Dried Beet Pulp fed group in 4 weeks	"	588	....	....	....	....	....	....	756	....	....
Beet and Molasses Meal fed group in 4 weeks	"	....	....	588	....	....	....	....	....	....	504
Bran fed group in 4 weeks	"	....	....	....	....	420	420	....	....	....	....
Alfalfa fed group in 4 weeks	"	....	....	....	588	....	....	756	....	....	....
Extra meal fed group in 4 weeks	"	....	588	....	....	....	....	....	....	501	....
Value of food fed group in 4 weeks	$	37.88	33.73	33.88	29.25	23.13	22.56	35.10	41.15	31.46	30.62
Value of food fed 1 cow in 1 day	c.	19·3	17·1	17·2	14·9	16·5	16·1	13·9	16·3	18·7	18·2
Milk produced by group in 4 weeks	Lbs.	2,356	2,040	2,722	2,550	1,818	1,795	2,952	2,838	3,567	3,103
Average daily yield of milk of 1 cow for 4 weeks	"	12	6·8	13·8	13	12·9	12·8	11·7	11·2	21·2	18·4
Total yield of 1 cow in 4 weeks	"	336·5	191·4	388·8	364·3	363·6	359	328	314	594·5	517·1
Yield of group during first week of period	"	642	534	703	639	527	454	837	625	894	881
Yield of group during last week of period	"	545	476	667	551	457	374	623	721	906	747
Change in yield of fourth week; decrease or increase	"	– 97	– 58	– 36	– 88	– 70	– 80	– 214	+ 96	+ 12	– 34
Normal percentage of decrease	"	– 11	– 11	– 11	– 11	– 11	– 11	– 11	– 11	– 11	– 11
Actual percentage of decrease or increase	"	– 15	– 11	+ 5	– 14	– 13	– 17	– 25	+ 15	+ 1	– 4

BEEF PRODUCTION.

During the year, somewhat less than usual has been done in the production of beef.

A number of lines of work were being concluded and no new work was undertaken. With one notable exception, the different lots fed showed a good profit and the year has, on the whole, been profitable for beef men.

The work reported upon includes three lots of steers raised upon the farm here and one lot of two-year-olds bought in Carleton county, Ont. The former were sold off at ages indicated in statements or else are still on hand. The purchased steers were fed for a short time only, and sent to the block in January, 1910.

SHORT KEEP.

Where steers can be put into the feed box in September, it is not infrequently the case that good profits can be made by selling in late December or early January rather than by carrying along till the spring. One advantage of feeding in such a way as to be ready to sell at the time mentioned is that the cattle are always about ready for the block should opportunity offer at any time after December 20 or thereabouts.

Lot 1.—Short Keep Steers, Two-year-old.

Number of steers in lot		7
First weight, gross, September 20, 1909	lbs.	7,455
First weight, average	"	1,065
Finished weight, gross	"	9,195
Finished weight, average	"	1,313·5
Total gain in 117 days	"	1,740
Average gain per steer	"	249
Daily gain per steer	"	2·12
Daily gain per lot, 7 steers	"	14·84
Gross cost of feed	$	121 46
Cost of 100 lbs. gain		6 33
Cost of steers, September 20, 1909		355 79
Total cost to produce beef		477 25
Sold 9,195 lbs. at $6 per 100 lbs., less 5 per cent		524 16
Profit		46 91
Profit per steer		6 70
Average cost per steer to start		50 82
Average selling price per steer		74 88
Average increase in value		24 06
Average cost of feed per steer		17 35
Amount of meal eaten by lot of 7 steers	lbs.	4,228·1
Amount of ensilage and roots	"	51,114
Amount of hay	"	3,043
Amount of straw eaten	lbs.	2,520

Meal consisted of bran, 1,500·8 lbs.; gluten meal, 2,306·3 lbs.; oil cake meal, 421 lbs. Clover hay, 2 parts; oat hay, 1 part; corn ensilage, 100 lbs.; turnips, 50 lbs. Straw cut and mixed with corn ensilage and pulped roots.

'CARRIED OVER' STEERS.

On March 31, 1909, these three steers formed part of a lot of 5 then 22 months old, sold for $4.75 per 100 lbs., live weight, less 5 per cent shrinkage. From the lot of five, these three were bought back at the same figure before leaving the stables, and carried on till January 15, 1910. These steers up to March 31, 1910, had not been profitable, for their record shows a small loss of $2.04 per steer up to that time.

The purpose in continuing the feeding of these steers was twofold. In the first place it was desired to see if they would redeem themselves if carried along till prices were better. In the second place, it was desired to see what could be done with dairy Shorthorn steers as were these.

The outcome, so far as profits were concerned, is rather disappointing, although just about what might have been expected. It is seldom indeed that steers in good shape as were these in March, 1909, can be carried over to the next winter with any assurance or even hope of profit on the outlay.

As to results of feeding, they were satisfactory. The three finished up into most excellent Christmas bullocks, and when slaughtered gave carcases equal to anything that the writer has seen on Canadian markets, thus demonstrating that dairy Shorthorns may leave good beef cattle. The fact of this lot not showing a profit is not due to their being from milking strains, but rather to their being carried too long.

Lot 2.—'Carried Over' Steers.

Number of steers in lot		3
First weight, gross, April 1, 1909	lbs.	2,660
First weight, average	"	887
Finished weight, gross, January 15, 1910	"	3,805
Finished weight, average	"	1,268
Total gain in 290 days	"	1,145
Average gain per steer	"	382
Daily gain per steer	"	1·32
Daily gain per lot, 3 steers	"	3·96
Gross cost of feed	$	133 73
Cost of 100 lbs. gain		11 68
Valuation put on steers, April 1, 1909		119 70
Total cost to produce beef		253 43
Sold 3,805 lbs. at $6.50 per 100 lbs. less 5 per cent		234 98
Loss		18 45
Loss per steer		6 15
Average valuation per steer to start		39 90
Average selling price per steer		78 33
Average increase in value		38 43
Average cost of feed per steer		44 58
Amount of meal eaten per lot of 3 steers	lbs.	4,712·6
Amount of ensilage and roots	"	43,869
Amount of hay	"	2,763
Amount of green feed	"	2,667
Amount of straw eaten	"	7,280

Meal consisted of bran, 1,232 lbs.; gluten meal, 2,838 lbs.; oil cake meal, 579·6 lbs., and corn meal, 63 lbs. Clover and peas and oat hay, corn ensilage, turnips, oat straw.

LONG FEED STEERS.

As containing some data of interest and value in connection with the 'long feeding' of steers housed from birth to block is submitted the following full history of the steers discussed as to their feeding during the last 290 days of their existence in lot 2.

Lot 3.

History of Long Feed Lot. Dropped May 1, 1907; slaughtered, January 15, 1910, aged 2 years 8½ months.

Number of steers in lot		3
First weight, gross, May 1, 1907	lbs.	252
First weight average	"	84
Finished weight, gross, January 15, 1910	"	3,805
Finished weight, average	"	1,268
Total gain in 990 days	"	3,583
Average gain per steer	"	1,184
Daily gain per steer	"	1·20
Daily gain per lot 3 steers	"	3·60
Gross cost of feed	$	252 37
Cost of 100 lbs. gain		7 10
Valuation put on steers, May 1, 1907		15 00
Total cost to produce beef		267 37
Sold 3,805 lbs. at $6.50 per 100 lbs, less 5 per cent		234 98
Loss		32 39
Loss per steer		10 80
Average valuation per steer to start		5 00
Average selling price per steer		78 33
Average increase in value		73 33
Average cost of feed per steer		83 12
Amount of meal eaten per lot of 3 steers	lbs.	7,312
Amount of ensilage and roots	"	79,932
Amount of hay	"	6,567
Amount of green feed	"	2,667
Amount of straw eaten	"	7,899
Amount of roots	"	2,226

'BABY BEEF.'

The series of experiments along this line is being concluded. Results seem to point to the possibility of making beef production pay, on even the most expensive lands, if this method is followed, but always on condition that the greatest care be exercised in the selection of good individuals with which to work, the careful feeding from birth to block, and, most important of all, the getting of the steers ready for the block at a very early age. Earliest maturing steers have invariably shown good profits; lots carried along have not infrequently shown losses.

To insure a profit, steers should be ready for the best butcher's trade by or before 20 months old.

Lot 4.

BABY BEEF.

Feeding period, April 1, 1909, to January 15, 1910.—Dropped June, 1908.

Number of steers in lot		5
First weight, gross, April 1, 1909	lbs.	2,475

First weight, average	"	495
Finished weight, gross, January 15, 1910	"	5,245
Finished weight, average	"	1,049
Total gain in 290 days	"	2,770
Average gain per steer	"	554
Daily gain per steer	"	1·91
Daily gain per lot 5 steers	"	9·55
Gross cost of feed	$	169 40
Cost of 100 lbs. gain		6 12
Valuation put on steers, April 1, 1909		100 50
Total cost to produce beef		269 90
Sold 5,000 lbs. at $6.50 per 100 lbs		325 00
Profit		55 10
Profit per steer		11 02
Average valuation per steer to start		20 10
Average selling price per steer		65 00
Average increase in value		44 90
Average cost of feed per steer		33 88
Amount of meal eaten per lot of 5 steers	lbs.	6,808
Amount of ensilage and roots	"	51,150
Amount of hay	"	3,350
Amount of straw eaten	"	4,830

BABY BEEF.

Life history, June 15, 1908, to January 15, 1910—19 months.

Number of steers in lot		5
First weight, gross, June 15, 1908	lbs.	545
First weight, average	"	109
Finished weight, gross, January 15, 1910	"	5,245
Finished weight average	"	1,049
Total gain in 580 days	"	4,700
Average gain per steer	"	940
Daily gain per steer	"	1·62
Daily gain per lot 5 steers	"	8·10
Gross cost of feed	$	244 90
Cost of 100 lbs. gain		5 21
Valuation put on steers, June 15, 1908		25 00
Total cost to produce beef		269 90
Sold 5,000 lbs. at $6.50 per 100 lbs		325 00
Profit		55 10
Profit per steer		11 02
Average valuation per steer to start		5 00
Average selling price per steer		65 00
Average increase in value		60 00
Average cost of feed per steer		48 98
Amount of meal eaten per lot of 5 steers	lbs.	8,888
Amount of ensilage and roots	"	66,900
Amount of hay	"	5,165
Amount of straw eaten and bedded	"	11,000
Amount of skim milk	"	8,533
Amount of whole milk		750

Meal consumed consisted of bran, 2,632·1 lbs.; oil meal, 1,317·5 lbs; gluten meal, 3,065 lbs., and corn meal 121 lbs. Corn ensilage, 100 parts; turnips, 25 parts; mangels, 15 parts; clover hay, 2 parts; mixed hay, 1 part; oat straw.

Lot 6.

STEER CALVES.

Dropped June, 1909.

Number of steers in lot		9
First weight, gross, June 22, 1909	lbs.	1,065
First weight, average	"	118
Gross weight March 31, 1910	"	4,659
Finished weight, average	"	518
Total gain in 282 days	"	3,594
Average gain per steer	"	399
Daily gain per steer	"	1·41
Daily gain per lot 9 steers	"	12·69
Gross cost of feed	$	158 34
Cost of 100 lbs. gain		4 40
Valuation put on steers, June 22, 1909		45 00
Total cost to produce beef		203 34
Valued, 4,659 lbs. at $5 per 100 lbs		232 95
Profit		29 61
Profit per steer		3 29
Average valuation per steer to start		5 00
Average value price per steer at finish, March 31, 1910		25 88
Average increase in value		20 88
Average cost of feed per steer		17 59
Amount of meal eaten by lot of 9 steers	lbs.	4,452·9
Amount of ensilage and roots	"	34,216
Amount of hay	"	4,820
Amount of straw eaten and bedded	"	6,317
Amount of skim milk	"	16,343

Meal consumed consisted of bran, 1,880 lbs.; gluten meal, 1,406·1 lbs.; oil meal, 1,067·5 lbs.; oats, 384·3 lbs. Mixed hay, 1 part; clover hay, 12 parts; oats and pea hay, 3 parts; oat straw, 2,341 lbs. fed; corn ensilage, 100 parts; turnips, 40 parts.

SHEEP.

Sheep have been kept on the Central Experimental Farm for the last ten years. No other breeds than Shropshire and Leicester have ever been bred. For several years so much trouble was experienced with stomach worm that it was feared sheep breeding would have to be abandoned. This was due to its being necessary to confine sheep almost entirely to a very limited area which, as was to be expected, resulted in infection. It is now hoped, however, that a way has been found to overcome this difficulty.

For the amount of labour involved and the cost of maintenance, the returns from the small flocks here have been quite as good as from any other line of live stock industry.

Very little experimental work of a character suitable for publication has been done as yet. The most important and interesting line of work was carried on during the last winter. The details of the work follow.

Considerable difficulty was experienced in securing, in this district, lambs fit to use in such work. Some wethers were found after some time, however, and fed as outlined below. The results from a financial point of view were very satisfactory, and should, in my opinion, suggest to sheep men the advisability of holding some of their lambs for winter feeding as such action would be an outlet for surplus forage and insure a much more remunerative price for the finished product.

As our Canadian cities grow, the demand for a superior article of lamb in the spring when supplies of fall-killed, cold-stored lambs are about exhausted (and very often of inferior quality), is certain to become much greater. Especially would this be true if a good article were available.

EXPERIMENT WITH FATTENING LAMBS.

In December, 1909, a lamb-feeding experiment was begun. The object of the experiment was to get some data as to the comparative value of turnips and corn ensilage as roughage for fattening lambs.

For this purpose, 28 lambs, about 7 months old, were selected and divided into three groups, as far as possible equal in weights and numbers. Twelve of these lambs were of Shropshire breeding and had been raised here. During the summer they had been somewhat troubled with worms and had not grown as they might have; a few of them were still low in flesh, though apparently healthy, at the time of going on experiment. Seven of these Shropshires were ram lambs and five were ewes. The sixteen others making up the groups were grade wethers of Leicester derivation bought in Carleton county, Ont. For three weeks previous to being delivered to the Experimental Farm they had been allowed to roam over the breeder's farm and feed on turnip tops and what other food they could find. They had been losing in flesh for some time before the experiment began. They had been purchased in November, but were not brought to the Farm until December 12.

On the 19th they were divided into three lots and put on experiment. The experiment lasted 90 days.

Lot 1.—Nine lambs, 3 rams and 6 wethers, weighed 900 lbs.

Lot 2.—Nine lambs, 4 rams and 5 wethers, weighed 901 lbs.

Lot 3.—Ten lambs, 5 ewes and 5 wethers, weighed 900 lbs.

The three lots were fed the same quantity of meal per head per diem throughout the experiment.

As roughage, lot 1 received as much turnips as they would clean up; lot 2 received as much ensilage as they would eat; lot 3 received as much turnips and ensilage as they would eat.

The roots and ensilage were fed in the proportions of about 7 of roots to 6 of ensilage. The hay was fed to each lot in varying quantities and just enough to give the ration sufficient dry material to keep the digestive organs about right. Details of feeding are given below.

After the experiment was started, so many ticks were found on the wethers that dipping was absolutely necessary. On December 26 the three lots of lambs were dipped. Their fleeces were so dense and heavy that five days were required to dry them in the cow barn. During that time they were all taken off the experiment and fed a ration of hay, corn ensilage and meal. This was rendered the more necessary on account of two sheep scouring, one in lot 1 and one in lot 2. On December 31 the experiment was resumed, and the different lots again fed as outlined above.

The hay they were fed was, from the beginning of the experiment to the last week of December, pea and oat hay of good quality. Next they were fed millet for one week, and then good alfalfa hay till March 5, 1910. From then to the end of the experiment, March 18, 1910, June-grass hay was fed.

The meal mixture was constant in composition: 200 lbs. nutted oil cake, 200 lbs. bran and 100 lbs. whole oats.

Of this mixture, each lamb received 8 ozs. per diem during the first week, 12 ozs. the second week, 14 ozs. the third week, 16 ozs. the fourth week, 17 ozs. the three succeeding weeks and 18 ozs. the remainder of the period.

The ensilage was made from a well-eared corn, cut in the early glazing stage.

The roots were turnips well kept.

The hours of feeding were regular. The morning feed was given between 8 and 8.30; the noon feed between 12 and 12.30, and the night feed between 4.15 and 4.45 p.m. Except in very few cases the same man was attendant.

The first weighing was made at 10 a.m. the day the lambs were put on experiment. Subsequent weighings were made every two weeks at the same hour till the last day of the experiment.

The health of the different lots was good at start, and remained so throughout the experiment, except in two cases where a couple of lambs scoured somewhat, one in lot 1 and another in lot 2. This condition was met with every time the hay ration got below one pound per sheep per diem, and necessitated the decreasing of the roots and ensilage until scouring lambs recovered.

One aim of the experiment throughout was to feed as large quantities of the roots and ensilage as possible; this accounts for one or two lambs going off feed. In some instances they did not actually scour, but their condition interfered with the regular feeding of the lots, thus materially lowering the daily rate of grain.

The safe minimum quantity of hay to feed daily per lamb would appear to be about one pound. The amount of other feeds fed should be gaged so that each lamb will be likely to take at least this amount of hay, otherwise the rate of gain may be lowered.

In calculating the cost of feeding, the following prices were charged:—

Roots (turnips)	$ 2 00	a ton.
Ensilage (corn)	2 00	"
Hay (mixed)	7 00	"
Bran	20 00	"
Nutted oil cake	35 00	"
Whole oats	25 00	"

TABLE 1.—LAMB FEEDING EXPERIMENT.

(Weights, Gains and Percentage Dressed.)

Ear Tag No.	First weight.	Last weight.	Gains.	Weight of Carcass.	Percentage Dressed.	Daily Gain per Sheep.
Lot 1	lbs.	lbs.	lbs.	lbs.	%	lbs.
No. 63	95	130	35	54	41·5	·38
54	100	133	33	60	45·1	·36
64	94	128	34	58	45·3	·37
953	88	103	15	45	42·8	·16
954	112	118	6	60	50·8	·06
952	105	121	16	61	50·4	·17
962	112	126	14	55	43·6	·15
963	106	126	20	64	50·8	·22
965	88	112	24	56	50·0	·26
Total	900	1097·0	197·0	513	———	———
Average	100	121·9	21·9	57	46·7	·24
Lot 2						
No. 51	128	164	36	74	45·1	·40
57	77	107	30	52	39·2	·33
60	87	108	21	46	42·2	·23
58	105	136	31	64	47·0	·34
960	93	110	17	55	50·0	·18
955	108	130	22	67	51·5	·24
957	99	116	17	53	45 7	·18
964	100	109	9	54	49·5	·10
958	104	118	14	61	51·7	·15
Total	901	1098·0	197·0	526.0	———	———
Average	100	122	21·9	58.4	46·9	·24
Lot 3						
No. 53	65	94	29	43	45·7	·21
65	62	82	20	43	52·4	·22
62	84	99	15	40	48·7	·16
59	85	110	25	not		·27
56	60	82	22	killed		·24
959	101	122	21	66	54·1	·23
950	114	128	14	65	50·7	·15
951	115	122	7	67	54·1	·7
961	98	117	19	53	45·3	·21
956	116	133	17	70	52·6	·18
Total	900	1089·0	189·0	447·0	———	———
Average	90	109·9	18·9	55·8	50·4	.21

TABLE 2.—LAMB FEEDING EXPERIMENT.

(Summary.—28 lambs.)

First weight, three lots, 28 lambs	lbs.	2,701
Average first weight	"	96·4
Rate of gain per day, average	"	0·23
Final weight of whole lot	"	3,284

Final weight, average	"	117·3
Cost of feeding 28 lambs 90 days	$	58 75
Total gain in period	lbs.	583
Cost of 1 lb. gain for whole lot	cts.	10·7

Amount of various kinds of feed consumed for one pound gain live weight during 90 days:—

Bran	lbs.	1·82
Oats	"	·91
Oil cake	"	1·82
Hay	"	6·16
Turnips	"	9·67
Ensilage	"	8·05
Amount dry matter consumed for one pound gain during period	"	12·2

TABLE 3.—LAMB FEEDING EXPERIMENT.

(Table of Weights and Gains.)

Date of Weighing.	Lot 1.		Lot 2.		Lot 3.	
	Total weights by lots.	Gain per lamb per day.	Total weights.	Gain per lamb per day.	Total weights.	Gain per lamb per day.
Dec. 19, '09	900	....	901	....	900	
Dec. 29, '09	920	·22	896	·06*	919	·19
Jan. 12, '10	981	·48	957	·48	999	·57
Jan. 26, '10	989	·06	970	·10	991	·06*
Feb. 9, '10	1,019	·24	996	·21	1,016	·18
Feb. 23, '10	1,045	·21	1,031	·28	1,029	·09
Mar. 9, '10	1,068	·18	1,072	·32	1,070	·29
Mar. 19, '10	1,097	·32	1,098	·28	1,089	·19
Average daily gain		·244		·244		·21

*Loss.

TABLE 4.—LAMB FEEDING EXPERIMENT.

General Statement.—Turnips vs. Corn Silage as Succulent Feed for Fattening Lambs.

—	Lot 1.	Lot 2.	Lot 3.
Number of lambs in lot	9	9	10
Number of days in experiment	90	90	90
Total weight at beginning of experiment	900	901	900
Total weight at end of experiment	1,097	1,098	1,089
Gain for period	197	197	189
Gain per head	21·88	21·88	18·9
Gain per head per day	·244	·244	·21
Quantity of meal eaten by lot for period	852	852	955
Quantity of mixed hay eaten by lot for period	1,385	1,116	1,091
Quantity of roots (turnips) eaten by lot for period	3,461	....	2,180
Quantity of ensilage (corn) eaten by lot for period	145	2,753	1,818
Total cost of feed	$19.[illegible]3	18.14	20 68
Cost of feed per head ....$	2·21	2.01	2.06
Cost per head per day	·023	·021	·022
Cost to produce 1 lb. gain	·10	·09	·109
Original cost of sheep at 5 cts. a pound live weight	45.00	45.05	45.00
Original cost of sheep plus cost of feed	64.93	64.19	65.58
Sold at 7·25 cts. a pound live weight	79.53	79.60	78.95
Net profit on lot	14.60	16.41	13.37
Net profit per lamb	1.62	1.82	1.30

TABLE 5.—LAMB FEEDING EXPERIMENT.

Some Scientific Findings in Connection therewith.

—	Lot 1.	Lot 2.	Lot 3.
Pounds dry matter required to produce one pound increase in live weight	12·20	11·95	13·14
Nutritive ratio of ration	1 : 4·6	1 : 4.6	1 : 4·4
Meal required to produce one pound increase in live weight	4·32	4·32	5·50
Roughage required to produce one pound increase in live weight	25·3	19·6	26.9
Hay required to produce one pound increase in live weight	7·03	5·6	5·7
Roots required to produce one pound increase in live weight	17·5	....	11.5
Ensilage required to produce one pound increase in live weight	....	14·0	9.6
Pounds digestible matter consumed to produce one pound increase in live weight	7·4	7·0	8·0

SWINE.

A large number of swine have been bred and handled during the year 1909-10. Prices for feed have been very high, but prices for pork have been unusually good and financial results have been very satisfactory, as the following summary of operations indicates.

SUMMARY OF PIGGERY OPERATIONS, 1909-10.

	$ cts.	$ cts.
Total sales during year	3,137 25	
Value of manure produced in year	200 00	
Value of pigs on hand April 1, 1910	2,425 00	
		5,762 25
Cost of feed during year	1,521 56	
Cost of labour	850 00	
Value of pigs on hand April 1, 1909	2,617 00	
		4,988 56
Profit for year		773 69

In addition to the actual sales, a considerable amount of experimental feeding, that it was expected would not prove very profitable, was carried on. The cost of feeds for such experiments is included above as well as the cost of extra labour involved in conducting such experiments. There were handled during the year about 450 pigs. Of course quite a large number of these were sold at two months old for breeding purposes. Prices for such range from $6 to $10 each.

SOWS.

The practice of wintering sows in the open with only single board cabins to protect them from the winter cold and snow has been continued. This has been done in the case of both aged and young (under one year) sows.

During the past winter, an experiment including some 34 sows of different ages and breeds was conducted to gain some data as to the comparative cost of wintering sows in various ways as outlined in the table below.

The sows fed inside in 1909-10 had given excellent results when wintered outside last year, 1908-9.

Lot 1.—These two sows were in 1908-9 among our best mothers, but, when fed as indicated and under adverse conditions as to quarters, the results were quite disastrous.

Lot 2.—These two sows were in 1908-9 very satisfactory producers and again gave us some good litters, but the pigs were not so vigorous and healthy as could have been desired.

Lot 3.—These sows had given good litters the previous year when fed similarly. They did well again, as the table shows.

Lot 4.—In wintering young sows, the growth of the sow must be considered as well as and even as more important than the young she carries. It has on this account been found necessary to feed young sows wintered outside more liberally than aged sows. Thus the young sows, although much smaller than the aged sows, cost half a cent a day more for food than did the aged. The table indicates the difference in the rations fed the two classes during the winter.

SOW FEEDING EXPERIMENT.

Lot.	No. and description of sows in pen.	Housing.	Date of commencing.	Date of finishing.	No. of days in experiment.	Amount of meal consumed.	Amount of roots consumed.	Amount of milk consumed.	Total cost of ration.	Cost of sow per day.	Ration.	Remarks.
									$ cts.	Cts.		
1	2 Aged.	Confined in pen 10×8.	Dec. 16, 1909.	April 6, 1910.	111	2,094	....	444	28 80	12·5	Barley, corn and shorts, equal parts by weight. 2 lbs. skim milk per sow per day.	Both sows got very fat and pigs came large, fat and weak, many having no hair. All dead but four within the first two days.
2	2 Aged.	Confined in pen 10×8.	Dec. 16, 1909.	April 6, 1910.	111	1,332	1,332	888	18 64	8·35	200 lbs. shorts, 100 lbs. oats, 200 lbs. bran-roots equal parts by weight with meal. 4 lbs. skim milk per sow per day.	Both sows gave large litters of uniform and fairly strong pigs.
3	20 Aged.	Wintered in open. Slept in cabins 6×8.	Dec. 13, 1909.	April 2, 1910.	111	5,860	22,600	Hay, 1,800	100 45	4·5	Clover hay fed long. Roots cooked and fed warm. Bran and shorts fed mixed with roots or dry.	Sows give large litters of excellent pigs. Mortality of young pigs very low.
4	10 Young.	Wintered in open. Slept in cabins 6×8.	Dec. 28, 1909.	April 6, 1910.	100	3,390	5,010	Milk. 2,250	50 22	5·0	Mixture of bran, oats and shorts, fed warm with cooked roots. Skim milk. Some raw roots with dry meal.	Sows giving good large litters of healthy pigs.

In all cases, the rations fed sows vary from month to month following a fairly regular gradation. To begin with, in early winter coarse rough feed is given in abundance. As the gestation period advances this is changed to a somewhat more nutritious ration until, at a few weeks before farrowing time, the sows are being very liberally fed on highly nutritious but easily digested food. In early feeding more particularly, the aim is to keep the digestive organs comfortably distended by suitable food which shall not at the same time be such as to cause undue fattening.

FATTENING RATIONS.

In September, 1909, a bunch of forty young sows was divided into eight groups of five each. They were, the first week, fed on a uniform ration as follows:—

Shorts	lbs.	500
Ground oats	"	100
Nestor or feed flour	"	100
Bran	"	100

Roots equal parts by weight with meal.
Skim milk, 2 lbs. per diem per pig.

This meal mixture with roots and skim milk in the proportions named has given such uniformly good results when fed here that it has been taken as a standard of excellence and other feeds are considered good or bad according as they equal or fall short of this ration in rate and economy of gains induced. In comparison with two lots fed on this ration, four lots were fed on a mixture of corn and barley, equal parts, and a half pound tankage per pig per diem. Tankage was supplied by Swift & Co., packers, Chicago, U.S.A.

Two other lots were fed on corn and barley, equal parts, without any other food.

Meal mixture was in all cases fed raw in a moderately thick slop. The subjoined tables show all details.

Feeds were valued as follows:—

Roots	$ 2 00	per ton
Corn	30 00	"
Barley	25 00	"
Oats	25 00	"
Nestor or feed flour	30 00	"
Shorts	25 00	"
Bran	20 00	"
Skim milk	4 00	"

TABLE 1.—PIG EXPERIMENT.

Pen 7. Starting period, Sept. 30, Oct. 5, 1909.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	c.	
Y 976........	111	123	12	......	......	......	......	......	......	......	500 lbs. shorts.
T............	92	102	10	......	......	......	......	......	......	......	100 " oats, gr.
Y 981........	127	146	19	68	13·6	2·7	103	103	1.41	2·0	100 " nestor.
B 909........	100	111	11	....	......	......	......	....	......	.....	100 " bran.
Y 971........	93	109	16	......	......	......	.....	...	......	......	Roots equal parts by weight with meal.
Total....	523	591	68	......	......	......	......	......	......	......	2 lbs. skim milk per pig per day.

Pen 8.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.
T 924........	99	119	20	......	.....	......	......	.....	......	......
T 922........	65	74	9	......	......	....	......	......	......	......
Y 979........	100	111	11	60	12·0	2·4	103	103	1.41	2·3
Y 980........	98	109	11	......	......	.....	......	......	......	......
Y 978........	85	94	9	.....	......	.....	.....	......	......	......
Total....	447	507	60	....	......	......	......	.....	......	....

Pen 3.

TABLE 2.—PIG EXPERIMENT.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
922	168	182	14	....	......	......	......	......	......	......	500 lbs. shorts.
930........	158	167	9	......	......	.....	.....	...	......	......	100 " oats.
931........	150	161	11	63	12·6	2·5	134	134	1.84	2·8	100 " nestor.
T............	120	134	14	....	......	......	......	.....	.....	...	100 " bran.
928........	110	125	15	.....	.....	......	......	......	......	.....	Roots equal parts by weight with meal.
Total....	706	769	63	......	......	......	.....	.....	......	......	2 lbs. skim milk per pig per day.

Pen 2.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.
907 A...	60	70	10	......	......	.....	......	......	......	.....
903 A........	70	80	10	42	8·4	1·6	74	74	1.03	2·4
908 A........	65	70	5	....	......	......	....	....	......	.....
902 A........	70	80	10	......	......	.....	..	......	.....	....
920.......	83	90	7	......	......	......	......	.. .	......	. .
Total....	348	390	42	......	......	......	......	......	......	.....

TABLE 3.—PIG EXPERIMENT.

Pen 4. Starting period Sept. 30, Oct. 5, 1909.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	c.	
Y 917	171	180	9	......	......	......	......	......	......	......	500 lbs. shorts.
T 903..........	141	147	6	......	......	......	......	......	......		100 " oats.
Y 937	145	158	13	53	10·6	2·1	134	134	181	3·4	100 " nestor.
Y 935	140	154	14	......	...	......	......	......	......	......	100 " bran.
T 913..........	105	116	11	......	......	......	......	......	......	......	Roots equal parts by weight with meal. 2 lbs. skim milk per pig per day.
Total	702	755	53	......	......	......	......	......	......	......	

Pen 1.

B 912..........	100	103	3	.....	......	......	....	.....	......	.....	
Y 996	98	103	5	......	......	...	......	......	.....	......	
B 913.	97	100	3	18	3·6	·7	74½	74½	1·04	5·7	
Y 900A........	84	85	1	......	......	......	....	......	....	.....	
Y 994	66	72	6	.....	......	......	......	......	......	...	
Total	445	463	18	....	......	......	......	.....	.....	.....	

TABLE 4.—PIG EXPERIMENT.

Pen 5.

918..........	102	108	6	......	......	......	......	......	......	......	500 lbs. shorts.
957..........	150	160	10	......	....	......	......	......	......	......	100 " gr. oats.
956..........	140	155	15	49	9·8	103	103	1·41	2·09	......	100 " nestor.
941..........	120	128	8	....	......	......	......	......	......	....	100 " bran.
927..........	100	110	10	......	......	.....	......	.....	......	.....	Roots equal parts by weight with meal. 2 lbs. skim milk per pig per day.
Total ...	612	661	49	......	......	......	......	......	......	......	

Pen 6.

Y 950	143	158	15	......	......	......	......	.....	......	......	
T 920..........	95	107	12	...	......	......	......	......	......	.....	
T 919..........	95	105	10	57	11·4	2·7	103	103	1·41	2·4	
Y 952	138	151	13	......	......	......	......	......	......	......	
Y 940	135	142	7	......	......	......	......	......	......	......	
Total.....	606	663	57	......	.....	......	......	......	......	.....	

TABLE 5.—PIG EXPERIMENT.

Pen 5. Main period, Oct. 5, Nov. 30, 1909.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	c.	
918	108	173	65								Corn and barley equal parts.
957	160	217	57								
956	155	209	54	272	54·4	·97	1,432	....	19 69	7·2	
941	128	187	59								
927	110	147	37								
Total	661	933	272								

Pen 6.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
950	158	206	48								
920	107	155	48								
919	105	151	46	275	55·0	·98	1,396	......	19.19	6·9	
952	151	210	59								
940	142	216	74								
Total	663	938	275								

TABLE 6.—PIG EXPERIMENT.

Pen 4.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
917	180	259	79								500 lbs. shorts.
963	147	215	68								100 " gr. oats.
937	158	227	69	361	72·2	1·28	1,402	1,402	19.76	5·4	100 " nestor.
935	154	235	81								100 " bran.
913	116	180	64								Roots equal parts by weight with meal.
Total	755	1,116	361								2 lbs. skim milk per pig per day.

Pen 1.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
912	103	160	57								
996	103	172	69								
913	100	157	57	291	58·2	1·03	963	963	13.83	4.8	
900 A	85	140	55								
994	72	125	53								
Total	463	754	291								

TABLE 7.—PIG EXPERIMENT.

Pen 3. Main period, Oct. 5, Nov. 30, 1909.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	c.	
922	182	263	81								
930	167	228	61								
931	161	240	79	351	70·2	1·25	1,644		22·60	6·4	Corn and barley equal parts with ½ lb. per pig per day tankage.
	134	188	54								
928	125	201	76								
Total	769	1,120	351								

Pen 2.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
907 A	70	140	70								
903 A	80	161	81								
908 A	70	148	78	375	75·0	1·33	1,172		16·11	4·2	
902 A	80	154	74								
920	90	162	72								
Total	390	765	375								

TABLE 8.—PIG EXPERIMENT.

Pen 7.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
976	123	192	69								
	102	137	35								
981	146	245	99	334	66·8	1·19	1,325		18·21	5·4	Corn and barley equal parts with ½ lb. per pig per day tankage.
909	111	185	74								
971	109	166	57								
Total	591	925	334								

Pen 8.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 56 days.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
921	119	148	29								
922	74	117	43								
979	111	207	96	313	62·6	1·11	1,169		16·07	5·1	
980	109	184	75								
978	94	164	70								
Total	507	820	313								

TABLE 9.—PIG EXPERIMENT.

Pen 5. Finishing period Nov. 30, Dec. 7, '09.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	Cts.	
918	173	190	17								
957	217	236	19								
956	209	233	24	98	19·6	2·8	132	132	1.88	1·9	Standard.
941	187	207	20								
917	147	165	18								
Total	933	1,031	98								

Pen 6.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
950	206	227	21								
920	155	170	15	79	15·8	2·2	132	132	1.88	2·3	
919	151	171	20								
952	210	217	7								
940	216	232	16								
Total	938	1,017	79								

TABLE 10.—PIG EXPERIMENT.

Pen 4.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
917	259	279	20								
903	215	217	2								
937	227	235	8	49	9·8	1·4	135	135	1.92	3·9	Standard.
935	235	245	10								
913	180	189	9								
Total	1,116	1,165	49								

Pen 1.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain L. W.	Ration.
912	160	172	12								
996	172	185	13								
913	157	173	16	71	14·2	2·0	122	122	1.75	2·4	
900 A	140	156	16								
994	125	139	14								
Total	754	825	71								

PIG EXPERIMENT TABLE 11.

Pen 3. Finishing Period Nov. 30, Dec. 7, 1909.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig, per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain, live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$	c.	
922	263	281	18								Standard.
930	228	253	25								
931	240	255	15								
	188	207	19	97	19.4	2.7	134	134	1.91	1.9	
928	201	221	20								
Total	1,120	1,217	97								

Pen 2.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig, per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain, live weight.
907 A	140	161	21							
903 A	161	184	23							
908 A	148	166	18	90	18·0	2·5	121	121		1·9
902 A	154	169	15							
920	162	175	13							
Total	765	855	90							

PIG EXPERIMENT TABLE 12.

Pen 9.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig, per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain, live weight.	Standard.
976	192	222	30								500 lbs. shorts.
	137	152	15								100 " ground oats.
981	245	258	13	93	18·6	2·6	123	123	1·76	1·8	100 " Nestor.
909	185	200	15								100 " bran.
971	166	186	20								Roots equal parts by weight with meal.
Total	925	1,018	93								2 lbs. skim milk per pig per day.

Pen 8.

Ear Tag Number.	Weight, Oct. 5, 1909.	Weight, Nov. 30, 1909.	Gain per pig in 7 days.	Gain per pen in 7 days.	Average gain per pig.	Average gain per pig, per day.	Amount of meal consumed.	Amount of roots consumed.	Total cost of ration.	Cost of one pound gain, live weight.
924	148	170	22							
922	117	135	18							
979	207	227	20	100	20	2·8	123	123	1 76	1·7
980	184	206	22							
978	164	182	18							
Total	820	920	100							

PIGGERY VENTILATION.

In wintering sows as outlined earlier in this report, the question of ventilation is a matter of great simplicity. When it becomes, however, a question of wintering pigs in warmer pens, as must be done in the case of young fall pigs if any profits are to be hoped for, the problem of securing an ample supply of fresh air, without lowering the temperature unduly, is exceedingly hard to solve. To gain some information on this subject, two single-pen piggeries were constructed in the autumn of 1898, special provision being made to try various systems of ventilation in each of them.

The buildings were constructed of wood with cement floors. They were in each case 16½ feet long, 15 feet wide and 8 feet ceiling, with double half-pitch roof and loft over head.

The walls were made of 4-inch studding, two papers outside and one paper inside, single board and batten outside and V-jointed inside. The joists were ceiled. There were four windows in each pen; they were hinged at the bottom and chained to hang about two feet open at the top when so desired. Double windows were used in winter.

The ceiling of pen 1 had a slightly inverted hopper shape with an outlet pipe from the centre or highest part of the ceiling. The ceiling of pen 2 was slightly higher at the back than at the front; besides this peculiarity, the ceiling or boarding under the joists stopped completely about 4 feet from the rear wall, leaving the joists exposed. Above the joists, rising from a point where the ceiling stopped, and reaching to the plate (about 2 feet above the joists) 3 or 4 short beams carry stout slats 2 inches thick nailed in place about 2 inches apart and running horizontally at right angles to the joists. These slats were covered with about 2 feet deep of loose oat straw.

During the continuance of the experiments, two bunches of feeding pigs were housed in these pens. They were usually equal in number and about equal in weight, so that the quantity of air required and the impurities to be carried off were about equal at all times in the two pens.

EXPERIMENT NO. 1.

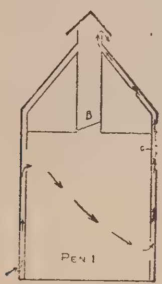
Since it would be exceedingly difficult to convey a clear idea of the direction of air currents and relative locations of inlets and outlets by the use of words alone, cross sections or diagrams are used.

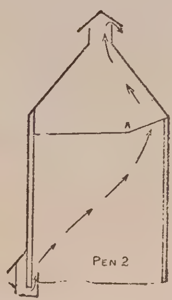
In pen 1, the King system of ventilation is in operation, the shaft 'B' being closed. At the point 'C' is an opening into the outlet flue, but it was kept closed during this experiment.

In pen 2, the escaping air works its way slowly up through the straw resting on the slats as previously described at 'A' and thence out through the open cupola on the roof.

VENTILATION TABLE 1.

Period 1. From Feb. 16, 1910 to Feb. 22, 1910, inclusive.	Outside. Temperature.		Pen 1. Temperature.			Pen 2. Temperature.		
	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.
	°	°	°	°	°	°	°	°
Degrees Fahr.	23·2	12.5	32·0	42·2	25·7	31·8	42·4	26·1
Variation from outside	....	....	....	19·0	13·2	....	19·2	13·6
No. of pigs in pen	....	....	10			10		
Remarks	....	....	Ceiling and walls damp			Ceiling and walls quite dry.		



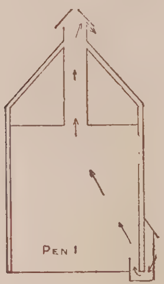


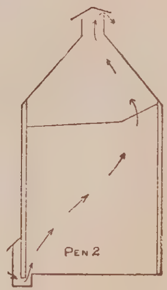
EXPERIMENT NO. 2.

In this experiment the King system was closed up and the Rutherford put into operation in pen 1. The effect was noticeable in the much drier atmosphere, walls and ceiling. In pen 2 the same system as in experiment 1 was continued.

VENTILATION TABLE 2.

Period 2. From Feb. 23, 1910, to March 8, 1910, inclusive.	Outside. Temperature.		Pen 1. Temperature.			Pen 2. Temperature.		
	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.
	°	°	°		°	°	°	°
Degrees Fahr.	23·6	10·1	30·5	42·2	26·4	29·5	40·6	26·0
Variation from outside	......	....	....	18·6	16·3	....	17·0	15·9
No. of pigs in pen	....	....		10			10	
Remarks	....	....	Ceiling and walls dry. Pigs quite comfortable.			Ceiling and walls dry. Pigs comfortable.		





EXPERIMENT NO. 3.

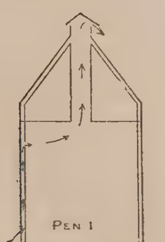
In this experiment trial was made of overhead currents entirely.

In pen 1.—The King inlet was combined with the Rutherford outlet.

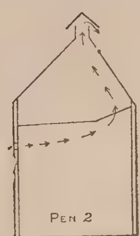
In pen 2.—An opening through the wall near the ceiling let in a direct and unobstructed current of air. The outlet was kept as in experiments 1 and 2. The results were fairly satisfactory, the pen being kept somewhat colder than was liked.

VENTILATION TABLE 3.

Period 3. From Mar. 9, '10, to Mar. 15, '10, inclusive.	Outside. Temperature.		Pen 1. Temperature.			Pen 2. Temperature.		
	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.	Av. 7.30 a.m.	Av. Max.	Av. Min.
Degrees Fahr.	° 30·2	15·5	° 32·2	° 43·8	° 29·7	° 29·8	° 41·2	° 28·2
Variation from outside	....	....	....	13·6	14·2	....	11·0	12·7
No. pigs in pen	....		10			10		
Remarks	....		Walls and ceilng dry.			Walls and ceiling dry.		



Pen 1



Pen 2

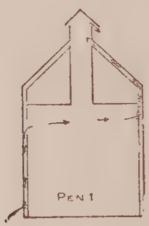
EXPERIMENT NO. 4.

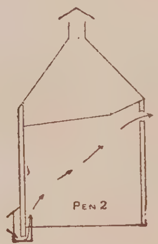
In this experiment the King system of ventilation was put into operation in pen 1, the upper outlet being opened instead of the lower.

In pen 2, the foul air was allowed a free outlet through direct opening in the wall. This was fairly satisfactory.

VENTILATION TABLE 4.

Period 4. From Mar. 16, '10, to Mar. 29, '10, inclusive.	Outside.		Pen 1.			Pen 2.		
	Temperature.		Temperature.			Temperature.		
	Av. Max.	Av. Min.	Av. 7:30 a.m.	Av. Max.	Av. Min.	Av. 7:30 a.m.	Av. Max.	Av. Min.
	°	°	°	°	°	°	°	°
Degrees Fahr.	32·1	20·4	36·6	47·8	31·0	33·0	43·7	32·5
Variation from outside	....	....	....	15·7	11·3	....	11·6	12·1
No. pigs in pen	....	....	....	7			7	
Remarks	....	....	Walls and ceiling fairly dry.			Walls and ceiling fairly dry.		





CONCLUSIONS.

Not quite enough work has as yet been done to permit of absolute conclusions being drawn. In addition to the above experiments, however, various lots of young feeding pigs, sows with pigs and weaning pigs were kept in these pens during the winter, 1909-10, just passed. The two systems shown in operation in experiment 2, as described above, were continuously retained in action. The results were uniformly satisfactory and would seem to point to either one or other of these two systems as being suitable for piggery ventilation in this latitude.

FINANCIAL STATEMENT.

Below are submitted inventories and returns from the various classes of live stock under my charge during the year April 1, 1909, to March 31, 1910.

Class.	April 1, 1909.		April 1, 1910.		Returns.	Gross returns made up of increase in value of products and value of animals sold.
	Number.	Value.	Number.	Value.	Value.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses	19	....	19	....	3,923 08	3,923 08
Breeding cattle	123	14,615 00	121	16,705 00	5,999 34	8,089 34
Steers	80	950 00	22	740 00	2,747 47	2,537 47
Sheep	31	690 00	54	775 00	38 22	123 22
Swine	130	2,617 00	65	2,425 00	3,137 25	2,945 25
Total	328	17,140 00	281	20,645 00	15,845 36	17,618 36

SUMMARY OF LIVE STOCK OPERATIONS.

Returns.

Gross returns from animals of all classes, including value of products, value of services and increases in value of young stock $17,618 36
Manure, 1,500 tons at $1 per ton 1,500 00

Total $19,118 36

Expenditure—Value of food consumed.

Meal, grain, &c. (market price) . . . . $ 5,715 30
Hay at $7 per ton 1,205 60
Roots, ensilage, green feed at $2 per ton 1,925 00
Whole milk, 18,700 lbs. at $1 per 100 lbs. 187 00
Skim milk, 65,000 lbs. at 20c. per 100 lbs. 130 00
Straw, 155 tons at $5 per ton 775 00

Total . . . . $ 9,937 90

Cost of labour in connection with care of horses, cattle, sheep and swine:—

Herdsman	$ 720 00	
One man	600 00	
Three men at $528	1,584 00	
Two men at $500	1,000 00	
Extra help, teaming, &c	350 00	
		$ 4,254 00
Total expenditure		14,191 00
Balance		$ 4,926 00
Less cost of steers and new stock purchased 1909-10		635 00
Net balance		$ 4,291 00

SUMMARY OF FARMING AND LIVE STOCK OPERATIONS ON 200-ACRE FARM, 1909.

Returns.

Total value of returns from fields	$ 5,502 15	
Total value of returns from live stock	19,118 36	
Total returns		$24,620 51

Expenditure.

Total cost of field operations	$ 2,778 71	
Total cost of live stock operations	14,191 00	
Expended, buying stock	635 00	
Total expenditure		$17,604 71
Balance		$ 7,015 80

COMPARATIVE Statement of Crops on '200 Acre Farm,' from 1899 to 1909 inclusive. (200 Acre Farm includes 7 Acres of Roads.)

Year.	Grain.		Hay.		Roots and Corn.		Pasture.		Soiling Crop.		Pig Pasture.		Remarks.
	Area in Acres.	Yield in Pounds.	Area in Acres.	Yield in Tons.	Area in Acres.	Yield in Tons.	Area in Acres.	Number of Cattle.	Area in Acres.	Disposition of Crops.	Area in Acres.	Crops Grown for Pasture.	
1899	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	....	....	Genrally considered a good year for all crops.
1900	80	126,621	53	138	40	743	20 and aftermath.	49	....	....	....	....	Season very favourable for most crops.
1901	79	114,472	58	210	40	702	16 and aftermath.	52	....	....	....	....	" " "
1902	74	144,914	60	216	39	665	20 and aftermath.	62	....	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903	69	126,619	62	154	34	473	16 and aftermath.	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.
1904	67	112,009	60	192	46¾	674	13 75	98	3	" "	3	" " ..	Season unfavourable for grain and corn, good for hay and roots.
1905	66	111,932	59	258	47	971½	14 and aftermath.	100	5	All cattle ensilage fed.	4	Clover, rape, mixed crop, peas, roots and alfalfa.	Season favourable for hay, corn and roots, too wet for grain on mucky land.
1906	69	125,516	62	140	48	774½	14	105	5	" " ..	3	" " ..	Very bad season. Meadows winter killed. Summer too dry.
1907	61	102,494	73	227	46	704	13-75	110	5	" " ..	3	" " ..	Bad hay year. Grain fair. Corn and roots poor.
1908	61	63,003	62	175	49	670	14	120	5	" " ..	3	" " ..	Very bad year for all classes of crops. Too dry.
1909	65	106,572	57	142	49	878	14	142	5				Bad hay year. Grain fair. Corn and roots good.

Of the area indicated as having been used as pasture for swine in 1905, 3 acres yielded a crop of green feed for soiling cattle before being given over to swine. Cattle were pastured on roads where possible. A small rough field not included in '200 Acre Farm' is used as partial pasture and a run for about 20 head of young stock. These cattle receive ensilage or other succulent food every day, and meal at the rate of about 1½ lbs. each per day part of the time.

The variety of crops grown and the varying areas under each crop each year, make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products and the return of each year valued accordingly.

Fixing prices as follows:—Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; summering cattle, $8 per season, and an area used as pasture for pigs, $15 per acre. The returns from the '200-acre farm' for the years mentioned may be said to have been worth $2,776.66 in 1899, $4,110.21 in 1900, $4,434.72 in 1901, $4,787.14 in 1902, $4,148.19 in 1903, $4,741.09 in 1904, $5,714.32 in 1905, $4,669.16 in 1906, $4,931.94 in 1907, $4,631.33 in 1908 and $5,502.15 in 1909.

Prices for all kinds of forage in 1908 and 1909 were so very high that had market prices been allowed for the crops of 1908 and 1909 the total values would have been much higher.

REMARKS ON ROTATION EXPERIMENTS.

The true farmer will ever have two objects in view when managing his farm: to so manage as to gradually but surely increase the margin of profit and, at the same time, render his farm more productive. Many factors will necessarily unite to produce such desirable results, but of one feature we may be certain, there will be followed on such a farmer's farm a regular rotation of crops, for no other single practice in farm management can compare with this in importance. The rotation or rotations adopted will, of course, depend upon the line of farming followed, and to some extent upon the character of the soil and the physical peculiarities of the farm as a unit, but a rotation there will be.

Crop rotation means a certain rotation of crops which regularly repeats itself each time the course is run. It really means further that the crops follow each other in such order as to insure each having such supplies of plant food of such a character as to aid in securing good returns from each particular crop.

Hence, in arranging a rotation, it is very necessary to have some knowledge of the food requirements of different crops and to know something of the values of the residues from the different crops included. Certain forage crops, such as corn, roots, potatoes and hay require an immense amount of food for stem, leaf and root production—that is an abundance of nitrates as is found in clover or other sod turned down and in well-manured lands. Other crops, such as cereals, can get along best with a lighter supply of nitrates, but need more phosphates, hence do well after some forage crop has taken up the superabundance of free nitrates found after sod. It is evident, therefore, that a good rotation will include (1) meadow or pasture, (2) roots or corn, and (3) some cereal crop.

Various combinations of these three classes are possible, and the natural aim of experimental work will be to determine (1) the comparative values of rotations as soil improvers, and (2) their relative suitability for different lines of farming.

Five or six years' experience with a rotation of five years' duration showed such remarkable results here, that, in 1904, it was decided to begin an experiment that would include a variety of rotations.

FERTILIZER ROTATIONS.

In addition to the regular rotations that have been under experiment since 1904, it has been found possible to introduce in 1909 three rotations having for object the gaining of some information as to the value of commercial fertilizers in regular farm rotation. Ever since the inception of soil cultivation work at the Central Experimental Farm, more or less experimental work has been carried on in the use of

commercial fertilizers. Up to the year 1909, however, no regular work had been undertaken to test the value of such fertilizers as substitutes to a greater or less extent for barnyard manure in regular farm crop rotations.

In 1909, it was found possible to take 12 acres of land whereon to conduct some experiments using superphosphate, muriate of potash and nitrate of soda as substitutes to a greater or lesser extent for the barnyard manure usually applied.

The land chosen includes light loam, heavy clay loam, clay hard pan and a considerable area of black muck. The land is all well drained and in fair heart, but rather badly infested with weeds. This condition is due to the land having been used for some years in rotation where no hoed crops were included.

The various rotations are, exclusive of fertilizer rotations:—

Rotation 'A.'

First year.—Land ploughed in August, well worked, ribbed in October; seeded next spring to oats, and 10 lbs. clover sown per acre; allowed to grow one year and turned under as fertilizer for corn.

Second year.—Corn, manure applied in winter or spring, 25 tons per acre; shallow ploughed, corn planted.

Third year.—Grain, seeded down, 8 lbs. red clover, 2 lbs. alsike, 10 to 12 lbs. timothy per acre.

Fourth year.—Clover hay, two crops expected.

Fifth year.—Timothy hay.

Rotation 'B.'

First year.—Grain, land ploughed previous autumn. Seeded down 10 lbs. red clover, 2 lbs. alsike, 5 lbs. timothy per acre.

Second year.—Clover hay, two crops expected.

Third year.—Corn, manured in winter, 20 to 25 tons per acre; spring ploughed.

Fourth year.—Grain, seeded down, red clover 10 lbs. alsike 2 pounds and 5 lbs. timothy per acre. Land fall-ploughed after corn; very shallow furrow.

Fifth year.—Clover hay, two crops; late fall ploughed.

Rotation 'E.'

First year.—Manured and handled as 'Z.'

Second year.—Oats, seeded down, 10 lbs. red clover, 6 lbs. alfalfa, 2 lbs. alsike, 6 lbs. timothy per acre.

Third year.—Pasture. Cattle.

Rotation 'Z.'

First year.—Manure, 12 to 15 tons per acre, applied winter; shallow ploughed in spring; well worked and planted to corn.

Second year.—Oats, seeded down, 10 lbs. red clover, 2 lbs. alsike, 6 lbs. alfalfa and 6 lbs. timothy per acre.

Third year.—Clover hay; two crops expected.

Rotation 'S.'

Shallow ploughing; deep cultivation by means of stiff tooth cultivator or subsoiler.

First year.—Roots or corn, plough August, 4 inches deep; manure 15 to 20 tons per acre; work at intervals, ridge up in fall, sow to roots in spring.

Second year.—Grain, seeded down, 10 lbs. red clover, 12 lbs. timothy per acre
Third year.—Clover hay.
Fourth year.—Timothy hay.

Rotation 'D.'

Deep ploughing; plough August, 7 inches deep; manure 15 to 20 tons per acre; work with cultivator at intervals. Land ploughed late autumn, 7 inches; roots or corn next spring.

Second, third and fourth year.—Same as 'S.'

Rotation 'H.'

First year.—Manured in fall and manure ploughed in, well worked; sown to roots next spring.

Second year.—Different grain mixtures suitable for feeding green. Different grass seed mixtures suitable for pasture and soiling next year.

Third year.—Pasture. Swine.

Rotation 'T.'

Sheep pasture.

Crops just as in 'S' save that various mixtures of grain and grass seed are used to test their value for sheep feeding and pasturing.

OTHER ROTATIONS.

Four other rotations were tried for some time. They included no hoed crop, however, and had to be discontinued as it was found impracticable to keep the land free from weeds.

RETURNS PER ACRE.

To compare results under such varied crop and cultural conditions is a rather difficult matter. The plan adopted has been to place an arbitrary and uniform valuation on all products and on pasturing various classes of stock. Following this plan, the returns per acre have been about as follows, the average of five years' work:—

Rotation 'A.'

Average value of crop per acre per annum.. .. ..$22 63

Rotation 'B.'

Average value of crop per acre per annum.. .. .. 23 15

Rotation 'E.'

Average value of crop per acre per annum.. .. .. 20 81

Rotation 'Z.'

Average value of crop per acre per annum.. .. .. 24 74

Rotation 'S.'

Average value of crop per acre per annum.. .. .. 26 05

Rotation 'D.'

Average value of crop per acre per annum.. .. .. 25 85

Rotation 'H.'

Average value of crop per acre per annum.. .. .. 29 10

Rotation 'T.'

Average value of crop per acre per annum.. .. .. 19 30

PROFITS PER ACRE.

The values placed on products were: Roots or silage stored, $2 per ton; hay, $7 per ton; grain, $1 per 100 lbs.; oat straw, $4 per ton; pasturing cows, $1 per month. Sheep and swine pastured, one cent per day.

In estimating cost of operation, labour is charged at prices paid, machinery is put at 30 cents per acre, rent at $3 per acre and manure at $3 per acre.

Net profits, after paying all expenses, were as follows per acre, the average for five years:—

'A' net profit per acre	$ 8 55
'B' " "	8 55
'E' " "	6 91
'Z' " "	8 39
'S' " "	7 22
'D' " "	7 07
'H' " "	7 61
'T' " "	3 31

VALUE OF DIFFERENT ROTATIONS

The averages used are for five years. A study of the various rotations would lead one to remark upon them briefly as follows:—

Rotation 'A.'—This rotation has been in use here for 11 years and has proven to be most excellent where carefully followed and cultural operations well performed. Where all land was under cultivation, it would be found necessary to devote a certain area to soiling crops. It might be extended to six years by leaving down to pasture for two years instead of one.

Rotation 'B.'—This rotation has been fairly successful here, but, for certain reasons not easily enumerated, I do not feel as though I could either criticise or praise as yet and feel sure of my ground.

Rotation 'E.'—This rotation would not be suitable for the average farmer, but might suit the man who had to buy rough forage.

Rotation 'Z.'—This would be a most excellent rotation to put into practice where sufficient rough land was available to serve as pasture. It is the rotation that would

most likely supply the greatest amount of forage of the best description for dairying or beef production. It is better suited for heavy than for light soils.

Rotation 'S.'—This is a rotation that has been in use for a number of years on the Agricultural College Farm at Guelph, where it has given satisfactory results. It is possibly open to the criticism of having too small a proportion of land under grain. Where live stock is, however, the mainstay, this is a very minor fault. The turning of a shallow furrow when ploughing sod has been found to be good practice here when preparing for grain or corn. In preparing for roots the regular plough with subsoiler is to be advised.

Rotation D.'—This rotation is the same as rotation 'S' so far as crops are concerned. The results so far obtained show the advantage in favour of either shallow ploughing and deep cultivation or deep ploughing.

Rotation 'H.'—The area devoted to pigs (some 10 acres) where this rotation is followed has given very satisfactory returns, and would, I feel confident, prove profitable to any one who followed it carefully.

Rotation 'T.'—Sheep. The returns from this rotation are not strictly comparable with those from others, since many side experiments materially affect the results. It has, however, proven very satisfactory for this class of stock.

As already stated, the rotation experiments have been under way for five years now. Three out of the five years have been what might be called 'lean years' in the Ottawa valley, hence these rotations can hardly be said to have yet shown what they are capable of doing in the way of influencing crop production.

The few facts given above are, however, strictly comparable each with the others, excepting possibly 'T' or sheep, where some rather disturbing conditions have been introduced.

THE ROTATIONS IN 1909.

The experiment to determine the values of the different rotations as discussed above is being followed up, and below the detailed report of the labour on each plot and the return therefrom, will be found some brief notes on each field and on the rotation as a whole.

The rotations are as follows:—

Rotation 'A.'—Five years. Clover hay, timothy hay, grain, corn, grain.

Rotation 'B.'—Five years. Clover hay, grain, clover hay, corn, grain.

Rotation 'E.'—Three years. Pasture, corn, grain.

Rotation 'Z.'—Three years. Clover hay, corn, grain.

Rotation 'S.'—Four years. Shallow ploughing, clover hay, timothy hay, roots, grain.

Rotation 'D.'—Four years. Deep ploughing, clover hay, timothy hay, roots, grain.

Rotation 'H.'—Three years. Hog pasture, roots, grain or soiling crops.

Rotation 'T.'—Four years. Sheep pasture, roots and soiling crops, grain, clover hay.

In the description of the rotations and fields that follow, an effort is made to give as concisely as possible the location of each field, its size, the character of its soil, its drainage and its general crop history.

In the tables will be found all items of expenditure. The manure is applied in the same ratio to each field in each rotation. To illustrate: If to the corn land in rotation 'Z' 15 tons of manure per acre is applied, this is equivalent to 5 tons per acre per anumn, as 'Z' is a three-year rotation. Then, in applying manure to 'B' 25 tons would be applied, as 'B' is a five-year rotation. Since manure must vary in quantity each year, $3 per acre per annum is charged in each rotation.

COMPARATIVE VALUES OF ROTATIONS ON STOCK FARMS.

Supposing the average animal of the bovine species to consume 2,000 lbs. hay, 6 tons ensilage and roots, 1 ton straw, 4 months pasture and 1,000 lbs. meal in a year, this would amount to about $37 or $38 as the cost of feeding an animal for a year. Keeping these figures in mind, the stockman can form some idea of the comparative values of the different rotations for live stock farming.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	1909.	Items of Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1908.	1909.	$ cts.	$ cts.
A 1	W.S. 3	30	45	....	....	25	....	....	9·96	Hay	Hay	59 76	12 94
A 2	L.S. 1	30	65	5	....	....	....	....	8·90	Grain	Hay	53 40	11 57
A 3	A.S. 14	10	15	20	20	15		20	10·20	Hay	Grain	61 20	17 11
A 4	W.P.G.S. 1 } F.S. 1	70	20	10	....	....	....	...	8·89	Grain	Grain	53 34	13 90
A 5	F.S. 3	....	35	30	10	15	10	....	8·56	Hay	Corn	51 36	14 62
	Aggregate								46·51			279 06	70 14
	Average per acre in 1909								1·00			6 00	1 50
	Average for five years								....			6 00	1 57

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1908.	1909.	Rent and Manure.	Seed, Twine and use of Machinery.
B 1	W.S. 4	5	35	5	50	5	....	....	10·00	Grain	Corn	60 00	17 00
B 2	L.S. 2	20	70	....	5	5	....	....	8·83	Corn	Hay	52 92	11 46
B 3	A.S. 15	20	60	5	....	15	....	..	10·20	Grain	Grain	61 20	17 00
B 4	W.P.G.S. 2	20	60	15	....	5	....	....	9·15	Hay	Grain	54 90	15 36
B 5	F.S. 2	....	30	30	40	....	....	....	8·93	Hay	Hay	53 58	11 60
	Aggregate								47·11			282 60	72 42
	Average per acre in 1909								1·00			6 00	1 53
	Average for five years								....			6 00	1 52

Rotation 'A.'

This rotation of five years' duration includes grain, hay (two years), grain and corn or roots, in the order named. The grain crop mentioned first comes after corn. With the first crop of grain is sown 10 lbs. red clover, 1 lb. alsike and 10 lbs. timothy per acre. The field is left in hay for two years; then in August of the second year it is ploughed and cultivated at intervals till October, when it is ridged up and left till next spring. Oats are sown on this field, and with them red clover seed at the rate of 10 lbs. per acre. This clover is allowed to grow for something over a year, or until corn seeding time the following spring, when it is turned under with a shallow furrow along with the manure that will have been applied during the winter. After the corn has been harvested, the land is ploughed shallow and left till the next spring.

The crops on this rotation have not been very satisfactory this year. On 'A 1' a crop of hay was grown. 'A 2' was in hay also, but on account of dry weather only one crop was harvested off each hay field. On 'A 3' the crop grown was oats and gave a very fair crop. 'A 4' gave a light crop of grain on account of lack of moisture as a large part of this field is sandy soil. On 'A 5' a crop of corn was grown and gave a fair return.

'A'

Expenses in Raising Crop in 1909. Manual labour. Hours.	Manual labour. Cost of Manual labour.	Horse labour. Hours, single horse.	Horse labour. Hours with team.	Horse labour. Value, horse labour.	Threshing.	Total cost.	Cost for one Acre.	Particulars of Crop in 1909. Grain.	Straw.	Hay.	Roots and Ensilage.	Total value.	Value of Crop per Acre.	Profit per Acre in 1909.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
53	8 83	3½	33	10 77	...	93 30	9 37	......	......	32,000	....	112 00	11 24	1 87
44½	7 41	5	38¾	12 87	......	85 26	9 56	......	......	48,300	....	169 05	18 09	8 53
56	9 33	4	172½	59 23	12 41	159 28	15 61	16,882	27,328	....	....	223 45	21 90	6 29
35	5 83	....	183½	35 16	8 21	116 44	13 00	11,174	15,676	....	....	143 09	16 09	3 09
242	38 66	12	197	68 79	......	173 43	20 26	......	......	....	245,000	245 00	28 62	8 36
430½	70 06	24½	544¾	186 82	20 62	627 71	.....	28,056	43,004	80,300	245,000	892 59	......	....
9·2	1 50	·5	11·7	4 01	44	......	13 50	603	924	1,705	5,267	....	19 18	5 68
15·3	2 37	4·8	9·92	4 34	29	......	14 65	596	739	1,854	6,084	....	22 63	8 55

'B'

Hours.	Cost of Manual labour.	Hours, single horse.	Hours with team.	Value, horse labour.	Threshing.	Total cost.	Cost for one Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total value.	Value of Crop per Acre.	Profit per Acre in 1909.
416	67 26	9	240	77 55	.....	221 81	22 18	......	......	....	352,240	352 24	35 22	13 04
60½	10 08	3	37½	12 00	.....	86 46	9 79	....	...	54,790	....	191 80	21 72	11 93
53	8 83	4	93	33 49	10 82	131 34	12 87	14,721	24,624	....	....	195 73	19 18	6 31
31	5 16	3½	102	36 62	8 27	120 35	13 15	11,268	18,942	....	......	150 56	16 45	3 30
94	15 66	4½	107	37 06	......	117 90	13 35	......	......	41,655	30,740	176 53	19 76	6 41
654½	106 99	24	579½	196 72	19 09	677 86	.....	25,989	43,566	96,445	382,980	1,066 86	......	.....
13·8	2 27	·5	12 3	4 17	40	......	14 38	551	924	2,047	8,129	....	22 64	8 19
13·1	2 65	5·3	9·5	4 41	31	.. ..	14 98	571	990	2,436	6,233	....	23 15	8 55

Rotation 'B.'

This rotation of five years' duration includes grain, hay, grain, hay and corn or roots in the order named, the first crop of grain following a crop of corn or roots. Red clover, 10 lbs.; alsike, 1 lb., and timothy, 5 lbs., is sown with the grain each time grain is sown. When grain follows hay, the land is ploughed in the early fall. When corn follows hay the land is ploughed in the spring, the spring growth of grass and clover being ploughed in along with the manure which will have been applied during the preceding winter.

The crops on this rotation were fairly satisfactory.

'B 1' was in corn and gave a good crop.

On 'B 2' a crop of hay was grown, but on account of dry weather the crop was not as good as expected.

'B 3' was under grain and gave a very fair crop. Banner oats.

'B 4.' The crop grown was oats; part of this field is light soil, and the summer being dry the crop was small.

From 'B 5' a good crop of mixed hay was harvested.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	1909.	Rent and manure.	Seed, twine and machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
H 1........	H.S. 1......	30	40	20	10	....	....	...	3·35	Roots..	Grain	20.10	5.05
H 2........	H.S. 2......	25	45	20	10	....	....	....	3·15	Oat hay....	Pasture.....	18.90	4.09
H 3.......	H.S. 3......	10	20	50	20	....	..	....	2·85	Pasture.....	Roots	17.10	3.70
		Aggregate.....							9·35	....	....	55.10	12.84
		Average per acre in 1909.....							1·00	....	....	6.00	1.37
		Average for five years.............								....	. . ..	6.00	1.07

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1908.	1909.	Rent and manure.	Seed, twine and machinery.
T 1........	S.S. 1......	10	90	....	....	....	....	...	1·51	Roots	Hay..	9.06	1.96
T 2........	S.S. 2......	15	85	....	....	....	....	....	2·78	Hay..	Roots	16·68	3.61
T 3...	S.S. 3......	....	100	....	....	....	....	....	3·27	Hay and Pasture...	Pasture.....	19.62	4.25
T 4........	S.S. 4......	15	85	....	....	....	....	...	3·50	Hay..	"	21.00	4.55
		Aggregate							11·06	....	....	66.36	14.37
		Average per acre in 1909.....							1·00	....	....	6.00	1.29
		Average for five years............								....	....	6.00	1.41

Rotation 'H.'

(Hog Farm.)

This rotation is of three years' duration, and includes roots, soiling crop and pasture in the order named. The land is ploughed late in the fall after it has been manured. It is disced the next spring and the roots sown on ridges. The roots receive the usual cultivation and are of varied character, including mangels, sugar mangels, sugar beets and turnips, devoted to pork production for the most part, the surplus being sold to cattle and the returns invested in meal for pig feeding.

The soiling crop field is sown with various crops suitable for feeding to pigs. What is over and above the amount possible of consumption by pigs is charged to the cattle at $2 per ton and the returns used to purchase meal for pork production.

The pasture area is divided into several parts, the seed being sown, as far as possible, at the same time as the soiling crops the previous year, and not allowed to be eaten too close the first fall, although any good growth is not wasted.

'H 1.'—This field was under grain and gave an excellent crop of oats.

'H 2.'—This plot was used for pasture.

'H 3' was under roots (turnips), and an excellent crop was harvested.

"H".

Items of expense in raising crop in 1909.								Particulars of crop in 1909.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of manual labour.	Hours, single horse.	Hours with team.	Value horse labour.	Threshing.	Total cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1909.
Hrs.	$ cts.	Hrs.	Hrs.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
28	4.66	.. .	41	12.75	4.60	47.16	14.07	6,258	15,002	....	....	92.58	27.63	13.56
. . .	. . .	....	....	......	......	22.99	7.29	......	......	....	. .....	31.50	10.00	2.71
207	31.05	25	46	20.71	.... .	72.56	25.46	......	......	....	160,356	160.35	56.26	30.80
235	35.71	25	87	33.46	4.60	142.71	46.82	6,258	15,002	....	160,356	284.43	......	....
358	3.80	2·6	9·5	3.57	0.49	......	15.26	669	1,604	....	17,161	....	30.42	15.16
42	4.51	5·4	9·0	4.22	0.16	....	17.07	201	453	168	18,441	....	29.10	7.61

"T".

9	1.50	1	32½	10.00	.... ..	22.52	14.91	......	.... .	6,800	....	23.80	15.76	0.85
129	19.35	20	76½	27.95	...	67.59	24.31	......	....	....	72,036	72.03	25.90	1.59
.....	... ..	....	....	......	......	23.87	7.30	......	......	....	....	32.70	10.00	2.70
...	......	....	....	.....	......	25.55	7.30	.....	......	....	....	35.00	10.00	2.70
138	20.85	21	109	37.95	.... .	139.53	53.82	......	......	6,800	72,036	163.53	......	....
12·4	1.88	1·8	9·8	3.41	.... .	......	12.61	......	......	614	6,513	....	14.78	2.17
28·0	4.12	5·2	9·0	4.02	......	......	15.40	.....	339	1,582	8,543	....	19.30	3.31

Rotation 'T.'

(Sheep Farm.)

This rotation of four years' duration includes roots, grain, hay and pasture.

The area devoted to sheep farming is rather limited, about 11·06 acres. This area is not included in the '200-acre' farm. The whole area has been for several years devoted to pasturing sheep, but it has been divided into four rather unequal fields, susceptible of further subdivision, and devoted to a rotation considered suitable for sheep.

The root field is devoted to white turnips, swedes, cabbage, kohl rabi, thousand-headed kale, &c. It comes after the pasture, the land being manured and ploughed in the fall.

Grain follows on the root land, and with the grain various clovers and grass seeds are sown to prepare for the ensuing two years. The grain may be harvested or used for soiling crop for sheep. The hay field is expected to give one crop of hay and then be devoted to pasture for lambs as soon as they are weaned.

The pasture field is the field that has been in hay the previous year. Alfalfa, red clover, alsike clover, brome grass (bromus inermis) and timothy are the clovers and grasses used.

The crops on this rotation were fair this year.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	Crops. 1909.	Items of Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
D 1........	E.G.P.S. 2..	20	80	...	....	....	....	....	2	Grain	Hay	12 00	2 60
D 2..	E.G.P.S. 4..	20	80	....	....	....	....	....	2	Hay..	"	12 00	2 60
D 3........	E.G.P.S. 6..	30	70	....	....	....	....	....	2	"	Roots	12 00	2 60
D 4........	E.G.P.S. 8..	60	40	....	....	....	....	....	1·56	Roots	Grain	9 36	2 44
	Aggregate								7·56	....	....	45 36	10 24
	Average per acre in 1909								1	.. ..	....	6 00	1 35
	Average for five years..................								.....	.. . .	....	6 00	1 22

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	Crops. 1909.	Rent and manure.	Seed, twine and use of machinery.
S 1........	E.G.P.S. 1..	20	80	....	....	....	....	....	2	Grain	Hay	12 00	2 60
S 2........	E.G.P.S. 3..	20	80	....	....	...	...	....	2	Hay	"	12 00	2 60
S 3........	E.G.P.S. 5..	30	70	....	....	....	...	....	2	"	Roots	12 00	2 60
S 4...	E.G.P.S. 7..	60	40	...	...	....	....	...	2	Roots .. .	Grain	12 00	3 15
	Aggregate								8	....	....	48 00	10 95
	Average per acre in 1909..............								1	....	....	6 00	1 37
	Average for five years.								......	....	.. ..	6 00	1 24

Rotation 'D.'

(Deep Ploughing.)

This rotation is of four years' duration and includes grain, two-years' hay and corn or roots.

The grain crop follows hoed crop, the land being ploughed to a depth of about seven inches, or cultivated after the hoed crops are harvested in the fall. With the grain is sown 10 lbs. red clover and 12 lbs. timothy seed per acre. The clover hay is cut twice in the season, and the second aftermath left on the field; that is, it is not pastured off as is usually done. In the second hay year two crops are cut if possible, and the land ploughed in August with a deep seven-inch furrow.

'D 1' and 'D 2.'—These plots were under hay this year; they gave fairly good crops.

'S 3' was under roots and gave an excellent crop.

On 'D 4' a light crop of grain was grown.

"D."

Expense in raising Crop of 1909.								Particulars of Crop in 1909.						
Manual Labour.		Horse Labour.												
No. of hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1909.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
13	2 16	1	7½	2 50	......	19 26	9 63	......	......	9,025	9,610	41 18	20 59	10 96
12½	2 08	1	7	2 35	......	19 03	9 51	.....	.....	8,270	......	28 91	14 47	4 96
210	31 50	6	80½	24 27	......	70 37	35 18	......	.....	......	100,190	100 19	50 09	14 91
6	1 00	....	18	6 06	1 41	20 27	12 99	1,922	2,768	....	....	24 75	15 86	2 87
241½	36 74	8	113	35 18	1 41	128 93	..	1,922	2,768	17,295	109,800	195 03	......	....
31·9	4 85	1	15	4 65	0 18	......	17 05	254	366	2,287	14,524	....	25 80	8 75
36·5	6 34	5·5	11·5	5 14	0 18	.. ...	18 97	632	552	2,977	10,937	....	25 85	7 07
"S."														
13	2 16	1	7½	2 50	.....	19 26	9 63	.. ..	......	8,140	9,720	37 76	18 88	9 25
12½	2 08	1	7	2 35	....	19 03	9 51	......	......	8,920	....	31 22	15 61	6 10
206	30 90	6	72	23 76	.. .	69 26	34 63	....	......	....	104,400	104 40	52 20	17 57
7	1 16	....	22½	7 50	1 85	25 66	12 83	2,529	3,211	....	....	31 71	15 85	3 02
238½	36 30	8	109	36 11	1 85	133 21	.....	2,529	3,211	17,060	114,120	205 09	..	. ..
29·3	4 53	1	136	4 51	0 23	......	16 65	316	401	2,132	14,265	....	25 61	8 99
42·4	6 29	6·6	112	5 48	0 20	......	18 83	603	562	2,977	10,841	....	26 03	7 22

Rotation 'S.'

(Shallow Ploughing.)

This rotation is of four years' duration and includes grain, two-years' hay, roots or corn.

The grain crop follows hoed crop, the land being ploughed (or cultivated) to a depth of about four inches after the hoed crops are harvested in the fall. With the grain is sown 10 lbs. red clover and 12 lbs. timothy seed per acre. The clover hay is cut twice in the season and the second aftermath left on the field; that is, it is not pastured off as is usually done. In the second hay year two crops are cut if possible, and the land ploughed in August with a shallow four-inch furrow. If manure is applied before ploughing, a subsoiler is attached to the plough to loosen up the soil to a depth of 8 or 9 inches. If manure is not applied, this end is attained by means of a strong, deep-reaching cultivator after the sod has rotted in the fall or the next spring.

'S 1' and 'S 2.'—These plots were under hay this year; they gave fairly good crops.

'S 3' was under roots and gave an excellent crop.

'S 4' was under grain and gave a light crop.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	Crops. 1909.	Rent and manure.	Seed, twine and use of machinery.
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	Ac.	1908.	1909.	$ cts.	$ cts.
E 1.........	W. S. 1.....	40	40	..	....	15	5	....	14·00	Grain	Pasture.....	84 00	18 20
E 2.........	L. S. 4......	10	60	....	10	20	....	....	13·75	Corn......	Grain	82 50	23 81
E 3.........	Morn.......	30	60	5	....	....	....	....	13·80	Hay.........	Corn......	82 80	23 99
	Aggregate........................								41·55	....	....	249 30	66 00
	Average per acre in 1909..............								1	....	....	6 00	1 58
	Average for five years..............								......	....	....	6 00	1 80

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1908.	1909.	Rent and manure.	Seed, twine and use of machinery.
Z 1..	W. S. 2.....	40	40	....	....	15	5	....	6·00	Grain	Hay.......	36 00	7 80
Z 2..... . .	L. S. 3......	10	60	10	....	20	....	....	5·81	Corn.... ...	Grain	34 86	9 42
Z 3.... ...	Obs. S......	10	60	20	10	....	....	....	3·50	Pasture.....	Corn.......	21 00	6 03
	Aggregate								15·31	....	. ...	91 86	23 25
	Average per acre in 1909..								1	....	....	6 00	1 51
	Average for five years..................								....	. ...	....	6 00	1 76

Rotation 'E.'

This rotation of three years' duration includes grain, pasture and corn.

The grain comes after the corn, the stubble of which is treated as described under rotation 'A.' With the grain in the spring is sown 10 lbs. red clover, 2 lbs. alsike, 6 lbs. alfalfa and 6 lbs. timothy seed per acre. If weather permits, the field is pastured slightly in the fall.

After the grain crop the land is pastured, the grass seeding having been done with this object in view. In estimating the value of the returns from this field pasture is charged at $1 per month per cow. At this rate the returns fall very far short of what would have been the returns if a hay crop had been harvested, if we may judge by the returns from 'Z.' This rotation and rotation 'Z' were introduced into the list in order to gain some idea as to the difference in returns probable from land pastured and land from which all the crops are harvested. It was expected that the corn crop after the pasture would in a measure make up for the difference in favour of the no-pasture rotation 'Z,' but the returns are on the whole a good deal short of those from 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover and grass in the spring.

Crops were all good on this rotation in 1909.

'E.'

Items of Expense in Raising Crop in 1909.								Particulars of Crop in 1909.						
Manual labour.		Horse labour.												
Hours.	Cost of manual labour.	Hours, single horse.	Hours with team.	Value, horse labour.	Threshing.	Total cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1909.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
.....	.....	.....	.....	......	......	102 20	7 30	......	.....	....	....	140 00	10 00	2 70
66	11 00	5½	150½	51 38	18 93	187 62	13 64	25,750	36,350	....	....	330 20	24 01	10 37
365	59 33	18	278½	94 08	......	260 20	18 85	......	....	....	456,645	456 64	33 08	14 23
431	70 33	23½	429	145 46	18 93	550 02	.....	25,750	36,350	....	456,645	926 84	.....	....
10·3	1·69	·5	10·3	3 49	1 45	......	12 53	619	874	....	10,990	....	22 30	9 77
16·0	1·84	2·8	9·5	6 15	38	....	14 65	555	802	....	8,729	....	20 81	6 91

'Z'.

44	7 33	5½	24	8 57	.....	59 70	9 95	......	......	35,020	....	122 57	20 42	10 47
24	4 00	2½	44½	16 46	7 57	72 32	12 44	10,302	15,398	....	.. ...	133 80	23 02	10 58
118	19 00	7	81	28 33	......	74 36	21 24	......	......	....	122,420	122 42	34 97	13 73
186	30 33	15	149½	53 36	7 57	206 38	43 63	10,302	15,398	35,020	122,420	378 79	...	....
12·1	1·98	·8	9·7	3 48	49	......	13 48	672	1,005	2,287	8,000	....	24 74	11 26
16·3	2·77	6·0	8·2	3 72	24	.. ...	12 57	522	813	2,087	9,321	....	23 68	8 39

Rotation 'Z.'

This rotation of three years' duration includes corn, grain and clover hay in the order named.

Corn comes after the clover hay. The manure is applied during the fall or during the winter and spring, and the clover allowed to grow up through it, so facilitating the turning under the whole mass of manure, late fall growth and spring growth of clover a few days before the corn is to be sown. The furrow turned is quite shallow, about five inches deep, and the land is then disc-harrowed and the corn sown in rows 42 inches apart. It receives later the usual cultivation and care.

Grain follows corn, the land having been ploughed in the fall. With the grain there is sown 10 lbs. red clover, 2 lbs. alsike, 6 lbs. alfalfa and 6 lbs. timothy seed per acre. The hay is cut twice and the last aftermath allowed to grow up to be turned under the next spring for corn. Such a rotation would be particularly valuable to a farmer having sufficient rough land for pasture, or to one desirous of keeping as many cattle as possible on the land at his disposal, supposing him willing to grow roots and corn.

Crops on this rotation were all good in 1909.

FERTILIZER

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1908.	1909.	Items Rent and Manure.	Seed, twine and use of mac'inery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
A 1	A.S. 2	....	25	75	....	....	....	...	1	Grain	Grain	5 25	1 60
A 2	A.S. 5	....	25	75	....	...	....	....	1	"	Hay	5 25	1 30
A 3	A.S. 8	....	....	10	....	90	....	....	1	"	Corn	5 25	1 67
A 4	A.S. 11	....	....	20	...	80	....	....	1	"	Hay	5 25	1 30
	Aggregate								4	....	....	21 00	5 87
	Average per acre								1	....	....	5 25	1 47

FERTILIZER

B 1	A.S. 3	....	25	75	....	....	....	....	1	Grain	Grain	7 50	1 60
B 2	A.S. 6	....	5	85	....	10	....	....	1	"	Hay	7 50	1 30
B 3	A.S. 9	....	....	....	....	100	....	....	1	"	Corn	7 50	1 67
B 4	A.S. 12	....	....	50	....	50	....	....	1	"	Hay	7 50	1 30
	Aggregate								4	....	....	30 00	5 87
	Average per acre								1	....	....	7 50	1 47

FERTILIZER

C 1	A.S. 4	..	25	75	...	....	....	...	1	Grain	Grain	6 60	1 60
C 2	A.S. 7	...	....	70	....	30	....	....	1	"	Hay	6 60	1 30
C 3	A.S. 10	....	....	....	....	100	....	....	1	"	Corn	6 60	1 67
C 4	A.S. 13	....	....	30	....	....	20	50	1	"	Hay	6 60	1 30
	Aggregate								4	....	....	26 40	5 87
	Average per acre								1	....	....	6 60	1 47

'*A.*'—This rotation is four years' duration and includes grain, hay two years, roots or corn. The grain follows roots or corn, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs. alsike and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year two crops are cut if possible. Then the land is manured at the rate of 15 tons, barnyard manure, per acre, and ploughed in August 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into a good tilth and sown to roots or corn.

'*B.*'—This rotation is of four years' duration and includes grain, hay two years, roots or corn. The grain follows roots or corn, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs. aliske and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year two crops are cut if possible. Then the land is ploughed in August 5 inches deep and worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into a good tilth and 300 lbs. superphosphate, 75 lbs, muriate of potash and 100 lbs. nitrate of soda is applied before being sown to roots or corn. In

ROTATION 'A.'

...of Expense in Raising Crop in 1909. Manual labour. Hours.	Manual labour. Cost of manual labour.	Horse labour. Hours, single horse.	Horse labour. Hours with team.	Horse labour. Value, horse labour.	Threshing.	Total cost.	Cost for one acre.	Particulars of Crop in 1909. Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1909.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
3	50	½	10¼	3 65	1 07	12 07	12 07	1,455	2,725	....	....	20 00	20 00	7 93
4½	75	½	11	3 83	......	11 13	11 13	.....	.....	3,890	....	13 61	13 61	2 48
26	4 30	2½	18	6 49	......	17 71	17 71	......	......	....	26,540	26 54	26 54	8 83
6	1 00	½	12	4 13	......	11 68	11 68	......	......	5,350	....	18 73	18 73	7 05
39½	6 55	4	51¼	18 10	1 07	52 59	52 59	1,455	2,725	9,240	26,540	78 88	78 88	25 29
9·8	1 64	1	12·8	4 52	27	.....	13 15	364	681	2,310	6,635	......	19 72	6 57

ROTATION 'B.'

3	50	½	10¼	3 65	1 18	14 43	14 43	1,615	2,735	....	....	21 61	21 61	7 18
4½	75	½	11	3 83	......	13 38	13 38	.....	......	3,675	....	13 56	13 56	18
26	4 30	2½	18	6 49	....	19 96	19 96	.....	......	....	28,290	28 29	28 29	8 33
6	1 00	½	12	4 13	...	13 93	13 93	......	......	5,530	....	19 35	19 35	5 42
39½	6 55	4	51¼	18 10	1 18	61 70	61 70	1,615	2,735	9,205	28,290	82 81	82 81	21 11
9·8	1 64	·1	12·8	4 52	29	......	15 42	404	684	2,301	7,072	....	20 70	5 28

ROTATION 'C.'

3	50	½	10¼	3 65	1 15	13 50	13 50	1,576	2,789	....	....	21 33	21 33	7 83
4½	75	½	11	3 83	......	12 48	12 48	......	.....	3,722	....	13 02	13 02	54
26	4 30	2½	18	6 49	......	19 06	19 06	.. ..	......	....	26,445	26 44	26 44	7 38
6	1 00	½	12	4 13	......	13 03	13 03	......	......	6,435	....	22 51	22 51	9 48
39½	6 55	4	51¼	18 10	1 15	58 07	58 07	1,576	2,789	10,157	26,445	83 30	83 30	25 23
9·8	1 64	·1	12·8	4 52	28	......	14 51	394	697	2,539	6,611	....	20 82	6 31

addition to the above the land receives a dressing of 100 lbs. nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass and just as the grain is coming through, when under grain.

'C.'—This rotation is four years' duration and includes grain, hay two years, roots or corn. The grain follows roots or corn, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs, alsike and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year two crops are cut if possible; then the land is manured at the rate of 7½ tons barnyard manure per acre and ploughed in August 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into a good tilth and 150 lbs. superphosphate, 37½ lbs. muriate of potash and 50 lbs. nitrate of soda is applied before being sown to roots or corn. In addition to the above the land receives a dressing of 100 lbs. nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass and just as the grain is coming through, when under grain.

MINOR DATA COLLECTED, 1909.

Ploughing.

1. Ploughing one acre with simple plough cost.. .. ..$ 2 00
   Ploughing one acre with two-furrow gang cost.. .. .. .. 1 25

Disc Harrowing.

2. Discing one acre with small disc (3 cuts necessary).. .. 0 90
   Discing one acre with large disc (2 cuts necessary).. .. .. 0 80
   Discing one acre with cutaway (1 cut necessary).. .. .. 0 45

Cost of Seeding.

3. Seeding one acre, two-horse seeder, cost.. .. .. 0 22½
   Seeding one acre, three-horse seeder, cost.. .. .. 0 18

Space between rows of grain.

4. One acre sown with 6-inch markers, single disc drill, yielded 15,779 lbs. of grain (oats), 24,586 lbs. straw.

One acre sown with 7-inch markers yielded 16,079 lbs. of grain, 26,896 lbs. straw.

Cost of cutting hay.

5. Cutting one acre of hay with 4½-foot cutting bar.. .. .. ..$ 0 31
   Cutting one acre of hay with 6-foot cutting bar.. .. .. .. 0 20
   Cutting one acre of hay with 7-foot cutting bar.. .. .. .. 0 18

Cost of cutting grain.

6. Cutting one acre of grain with 6-foot binder, cost.. .. .. 0 28
   Cutting one acre of grain with 8-foot binder, cost.. .. .. 0 20
   (Three horses used on each machine.)

Man versus Machine for cutting corn.

7. It required 12 hours time of man to cut one acre of corn in hills (3 x 3.)

It required two hours time of (three-horse team) harvester to cut one acre of corn in rows 3½ apart.

Sowing Corn.

8. After land was prepared it cost 64 cents to mark and hand plant in hills (3 x 3) one acre of corn. After land was prepared it cost 20 cents to sow one acre with large seeders in rows 3½ feet apart.

Cultivating Roots.

9. It cost 62 cents per acre to cultivate roots with single cultivator (once over). It cost 45 cents per acre to cultivate roots with double cultivator (once over).

Methods of Sowing Turnips.

10. Turnips sown on the flat yielded 61,640 lbs. per acre. Turnips sown on drills yielded 55,392 lbs. per acre. Turnips sown 2 feet apart in rows yielded 56,008 lbs. per acre. Turnips sown 2½ feet apart in rows yielded 61,024 lbs. per acre.

REPORT OF THE HORTICULTURIST

W. T. MACOUN.

OTTAWA, March 31, 1910.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the Twenty-third Annual Report of the Horticultural Division.

In this report will be found information in regard to that part of the work of the Division which it was thought desirable to deal with this year.

I have the honour to be, sir,
Your obedient servant,
W. T. MACOUN,
Dominion Horticulturist.

CHARACTER OF SEASON.

In the Annual Report of the Horticulturist for last year, a record was published of the dates when the frost was out of the ground sufficiently and the ground dry enough to dig in the nursery at the Central Experimental Farm. The average date for the eleven years, 1898-1908, was April 11, or leaving out two very exceptional years, the average for nine years was April 15. It is interesting to know the dates when winter set in during the past twelve years, for which time a record has been kept in the Horticultural Division. The dates are those when ploughing was no longer possible, either because of frost or snow. The record is as follows: 1898, November 26; 1899, December 4; 1900, November 13; 1901, November 14; 1902, November 25; 1903, November 16; 1904, November 24; 1905, November 27; 1906, November 26; 1907, November 25; 1908, December 1; 1909, November 22. The average date for the twelve years was thus November 24.

By April 6, 1909, the ground was bare of snow in places, and by the 13th the snow was about gone and the frost was sufficiently out of the ground to use the spade in the nursery, though the soil was still rather wet. April was a cool month, the lowest temperature being 14·5° F. on the 10th, and the highest 64° F. on the 13th. There was frost on twenty-three days. Precipitation was well distributed during the month. On the 30th there was a heavy snowstorm, followed by rain. The last spring frost was on May 4, when the temperature was 30·5° F., the lowest temperature during the month. The highest temperature was 75·5° F. on the 14th. May was a cool month also. There were frequent showers during the month. The blooming season of fruit trees was very late. The weather was only moderately warm in June, although the temperature rose on the 22nd to 91·8° F. The nights were cool. But little rain fell during the early part of the month, and by the 12th the need of more rain was becoming apparent, but heavy rain on the night of the 13th wet the ground well. By the end of June, vegetation was still backward, though

most things were looking well. A number of the apple trees became badly infested with aphis near the end of June. July was only moderately warm and most of the nights were cool. There were no long spells of hot weather. The highest temperature was on the 15th, when the temperature rose to 89·8° F. The rainfall was well distributed through the month. The days in August were warm, on the whole, but the nights, as in the early part of the summer, were comparatively cool. The hottest period of summer was from the 2nd to the 9th, when the maximum temperatures ranged from 82·4° F. to 95·4° F. The warmest day of the summer was on August 25, when the temperature was 95·6° F. There was a bad infestation of aphis on potatoes in August. The apple aphis also continued plentiful until about the middle of the month, or about the time when the last spraying was made for them.

In September, the days were moderately warm and the nights cool. No frost was recorded in September, the lowest temperature being 36° F. on the 29th. The shot-hole fungus was very injurious to plum trees in September, notwithstanding thorough spraying. A considerable quantity of plums burst on the trees, apparently due to the wet weather when the fruit was ripening. October was a fine month. The first autumn frost occurred on October 13, when the temperature was 29·8° F. The leaves of tender plants were killed where exposed to the morning sun, but in shady places they were but slightly injured. The first killing frosts were on October 20 and 21, up to which time the tenderer plants were still alive. There was an abundance of rain in November, thoroughly wetting the ground before winter set in on November 22 with about two inches of snow on the ground, which was slightly frozen. There was no good sleighing until December 7. December, January and February were exceptionally fine winter months, with comparatively high temperature. During these months the temperature was below zero but 18 times. The coldest day of the winter was on February 7, when the temperature was 19·4° F. below zero. Several thaws of short duration occurred during the winter, but, although the snow was never more than from fifteen to eighteen inches deep, the ground did not become bare until the end of February, when it began to show in places. March was a fine month with little precipitation, and, although the temperature fell below zero twice, it was above freezing on twenty-five days, making a mild month with the highest temperature 69·5° F on the 29th. By March 21 there was little snow left except where drifts had been. By the 28th the ground was dry enough to dig in parts of the nursery and the frost out except in a few spots. The upper part of the orchard could also be ploughed on this date. The winter of 1909-10 has been one of the most favourable for fruits that has been experienced at the Central Experimental Farm.

FRUIT AND VEGETABLE CROPS.

While the crops of some kinds of fruit were not more than medium in 1909, there was, as a rule, an abundant supply of good quality. The apple crop was a fair one, on the whole, in the province of Ontario, although the crop of summer apples was comparatively light. In the province of Quebec the crop was below medium. There was more codling moth than usual, and the apple aphis did much damage, but the apple spot was not so injurious as in some seasons. Apples were smaller than the average owing to a late spring, to dry weather in some places, and to the apple aphis in others. The pear crop was light to medium with fruit of good quality. Plums were a medium to good crop. Peaches medium to good and of good quality. In Southwestern Ontario the cherry crop was good both in quantity and quality. There was a good crop of grapes, but, owing to the low price obtained, the revenue to the growers was comparatively small. The crop of bush fruits was good both in Ontario and Quebec. The strawberry crop promised to be a large one, but was reduced somewhat by the dry weather, hence was not more than a medium one.

At the Central Experimental Farm there was a fair crop of apples of good quality, practically free from apple spot and comparatively little injured by codling moth. There were but few European plums, as usual. The crop of Americana and Nigra varieties was medium. There were practically no cherries. The crop of grapes was a fair one and many varieties ripened well. There were good crops of raspberries, currants and gooseberries.

Most vegetables gave good crops in Ontario and Quebec in 1909. The potato crop in both provinces was better than the average. At Ottawa it was good where new seed was used, but from seed which had been weakened in vitality by drought during the previous three seasons the yield was poor.

MEETINGS ATTENDED, PLACES VISITED AND ADDRESSES GIVEN.

As usual, quite a number of meetings were attended during the past year and addresses were given at most of them.

On April 3, 1909, an address was given before the Perth Horticultural Society on 'The Flower Garden;' Renfrew Farmers' Institute at Burnstown, Ont., June 23, 1909, on 'Fruit Culture;' summer meeting of the Quebec Pomological Society, La Trappe, Que., on August 24 and 25, 1909, 'The Best Remedies for the Most Injurious Insects and Fungous Diseases Affecting Fruits;' biennial meeting of the American Pomological Society, St. Catharines, Ont., September, 14-17, 1909, 'Grape Growing in the Colder Districts;' annual meeting of the Society for Horticultural Science, St. Catharines, September 13, 1909, 'Overcoming Winter Injury;' annual meeting of the Ontario Fruit Growers' Association, Toronto, Ont., November 10-11, 1909, 'Report on New Fruits' and 'A More Uniform System of Judging Fruits for Eastern Canada;' annual meeting of the Canadian Horticultural Association, Toronto, Ont., November 10-11, 1909, 'Some of the Best Native Plants for Cultivation;' annual meeting of the Ontario Vegetable Growers' Association, Toronto, Ont., November 11, 1909, 'Potato Culture with Especial Reference to the Importance of Using Seed of Strong Vitality;' annual meeting of the Ontario Horticultural Association, Toronto, Ont., November 10, 1909, 'Report on Novelties;' annual meeting of the Quebec Pomological Society, Macdonald College, Que., December 9-10, 1909, 'Plum Culture in the Province of Quebec;' meeting of the St. Catharines Horticultural Society, March 31, 1910, 'The Intelligent Care of Garden Plants.'

Addresses were also given in connection with short courses at the Agricultural College, Truro, N.S., and at the Ontario Agricultural College, Guelph, Ont. At Truro, on January 5-6, 1910, the subjects were: 'Some Things it is Necessary to Know When Establishing an Orchard,' 'The Culture of Small Fruits for Home and Market,' 'The Culture of Vegetables for Home and Market.' At Guelph, January 28-29, 1910, on 'The "Why" of Orchard Cultivation,' 'Grape Growing in Northern Sections,' and 'Market Requirements.'

While attending the meeting of the American Pomological Society in September I had the opportunity of visiting a number of the orchards in the Grimsby, St. Catharines and Niagara River sections of the Niagara peninsula and learned as much as I could at that time of the methods of the fruit growers there and of the crops which they were growing. In August I attended a meeting of the advisory board of the Fruit Experiment Stations of Ontario at the Horticultural Experiment Station at Jordan Harbour, and, while there, learned something of the experimental work being carried on at that institution. The Toronto Exhibition was attended on September 7, when I judged part of the collection of fruit there. On October 5, 6 and 7, I was at the Nova Scotia Horticultural Exhibition at Middleton, N.S., and judged a large collection of fruit. While in Nova Scotia at that time, I took the opportunity of seeing as much as possible of fruit and fruit culture in the Annapolis valley, including a visit to the cranberry bogs near Auburn.

ACKNOWLEDGMENTS.

During the past year I have been ably assisted in the Horticultural Division by those who have charge of the various branches of the work, and I have much pleasure in taking this annual opportunity of acknowledging the services of Mr. J. F. Watson, secretary; Mr. H. Holz, foreman to the Horticultural Division; Mr. F. Horn, foreman in the arboretum and botanic garden, and Mr. Horace Reid, foreman in the orchards and vegetable plantations. I desire also to express my appreciation of the faithful work of the other men employed in the Horticultural Division.

To those in Canada and in other parts of the world who, through their kindly interest and assistance by correspondence and donations of plants and seeds, have helped to make the work of this Division effective, I also feel much indebted.

DONATIONS.

This occasion is taken to publicly acknowledge the receipt of the many interesting things which were donated to the Horticultural Division during the past year, and to express our appreciation of the kindness of those who have contributed to the value of the work in this way. Following is a list of the seeds, plants, &c., which were donated:—

Sender.	Donation.
Ames, Experiment Station, Ia., U.S.	Seeds of *Pyrus Ioensis*. Scions: Evaline, Summer strawberry, Delavan, Red June, Colorado Orange, and Fall Orange apples.
Attridge, H., London West, Ont.	Squash seed.
Ball, J. Raymond, Knowlton, Que.	Danish Roundhead and Burpee's New Fordhook muskmelon. Early Wonder Sweet and Tait's Early White flint corn, ears.
Barrett, P., Truro, N.S.	Potato seedling.
Bonewall, Geo. L., North Augusta, Ont.	Potatoes, Leeds Beauty.
Brodie, Robert, Westmount, Que.	Scions of two seedling apples. Seed of Paul Rose melon and of large melon.
Carter, Jas. H., Abbotsford, Que.	Scions of Victoria apple.
Castleman, J. H., Langley Prairie, B.C.	May Wonder potato.
Cooper & Nephews, Toronto, Ont.	1 gallon each of V-2 and V-3 spray fluids.
Delworth, Thos., Weston, Ont.	Nitro Bacterine for onions.
Ferwell, W. E., Orillia, Ont.	Potato seedling.
Foyston, F., Minesing, Ont.	Scions of Bird Cherry.
Francis, D., Perth, Ont.	Cuttings of European grape.
Fuller, Mr., Aylmer, Que.	Scions, apple.
Geneva Experiment Station, N.Y., U.S.	Scions, Red June apple, 12 plants Louboro, Marlative, and June raspberries.
Grant, H. N., Newtonbrook, Ont.	Scions, seedling apple.
Harkness, A. D., Irena, Ont.	Scions of Red Fameuse apple.
Harner, G. S. W., Arlington Beach, Sask.	Harner Delight potato.
Hawkings, J., Ridgetown, Ont.	French Monarch potato.
Heikel, B. W., Lantbrukstyrelsen, Helsingfors, Finland	Apple and pear scions.
Hitchcock, G. P., Massawippi, Que.	Scions of seedling apple.
Howard & Son, Belchertown, Mass., U.S.	12 plants No. 17 seedling strawberry.
Johnson, J. E., Simcoe, Ont.	Scions of Strawberry King apple.
Johnston, J. W., Campbellford, Ont.	Gooseberry, raspberry and strawberry plants.
Jones, Harold, Maitland, Ont.	Scions of Red Fameuse apple and seedling pear.
Lafer, J. W., Catawba Island, Ohio, U.S.	Plant food.
Laughton, W., Lancaster, Ont.	Mushrooms.
Lyons, Wm. J., Millbrook, Man.	Potatoes, Michigan Rose.
McCluskey, R. A., Dawson, Yukon Territory	Gold Nugget and McCluskey potatoes.
McLean, C., Burton, N.B.	Scions of Burton apple.
Moore, W. H., Scotch Lake, N.B.	Scions of seedling apple.
Morrow, J. F., Calumet, Que.	Scions, apple.
Newman, C. P., Lachine Locks, Que.	Plants of wild blackberry. Seedling raspberry. 24 plants Meade strawberry.
Niven, R. B., Toronto, Ont.	Wild plants.
Reid, Peter, Chateauguay Basin, Que.	Apple scions.
Ryer, Ralph H., Sand Beach, N.S.	Plants, seedling strawberry.

Sender.	Donation.
Roe, T. W., Looma Vista, Alta..	Potatoes, seedling.
Rowbottom, Frank E. K., Fartown, Sask.. ..	Genessee Flat potato.
Rowley, Jos., Cummings Bridge, Ont..	Scions, Joseph Plum.
Saunders, W. E., London, Ont..	Ginseng seed.
Scott, Chas., Elpinstone, Man..	Epicure potato.
Shaw, Prof. Percy J., Truro, N.S..	Black beans.
Smith, Arthur, Riverview Nursery Co., Woodstock, Ont..	1 pound each of Satisfaction and Veribest potatoes.
Smith, A. D., Glendale, N.S..	Potatoes, Blue, and Pink seedling.
Snelling, W. H., Rockliffe Park, Ont..	Seed of White Delphinium.
Sutton & Sons, Reading, England..	1 pound Sutton's White City potato.
Taylor, H. A., Vermilion, Alta..	Potatoes.
Washington, U.S., Bureau of Plant Industry..	Apple scions.
White, Mrs. Annie G. H., Toronto, Ont.. ..	*Monarda didyma* and *Epipactis plants*. One plant *Epigaea*.
Wilmot, Henry, Oromocto, N.B..	Scions of Belmont apple.
Wilson, A. E., Clarence, Ont..	Wild plums.
Wootton, T. H., Wellman's Corners, Ont.	Scions of Crown apple.

PLANT DISEASES.

When the Experimental Farms were organized, part of the work undertaken by the Botanist was the investigation of plant diseases. This work was continued by the Botanist until 1894, when the Horticulturist, who had been conducting most of the experiments for the control of fungous diseases, was given charge of the entire work with plant diseases. Dr. James Fletcher, Entomologist and Botanist, states in his annual report for 1894 (page 183): 'In accordance with an arrangement made last spring, the work upon parasitic fungous diseases is now carried on by Mr. Craig, the Horticulturist.' From 1894 until this year, the Horticulturist has thus dealt with the work in connection with plant diseases. During the past fifteen years, many specimens of diseased plants have been sent to the Horticulturist for name, and in most cases he has been able to identify the disease and give the necessary information for its control. With his many other duties, however, it was not possible for him to thoroughly investigate all the diseases brought under his notice. From 1890 to 1897, Mr. John Craig was Horticulturist of the Central Experimental Farm, since which time the writer has held that position. On the appointment of Mr. H. T. Güssow as Botanist to the Experimental Farm in 1909, the work in plant diseases was transferred again to the Botanical Division.

In the reports and bulletins which the Horticulturist has prepared during the past twenty years the following diseases have been discussed or described, many of the diseases having been dealt with a number of times:—

Apple.—Fire Blight, *Bacillus amylovorus* (Burr.) De Toni; Dry Rot, Brown Spot, or Baldwin Spot; Core Rot; Black Spot or Scab, *Venturia Pomi* (Fr.) Wint.=(*Fusicladium dendriticum*, Fckl.); Sooty Fungus, Fly Speck Fungus, *Leptothyrium Pomi* (Mont. & Fr.) Sacc.; Bitter Rot, Ripe Rot, *Glomerella rufomaculans* (Berk) Spauld and Von Schr.; Crown Gall.

Cherry.—Brown Rot, Ripe Rot, *Sclerotinia fructigena* (Pers.) Schroet,=(*Monilia fructigena* Pers.); Black Knot, *Plowrightia morbosa*, (Schw.) Sacc.

Currant.—Leaf Spot, Rust, *Septoria Ribis*, Desm.; Currant Anthracnose *Gloeosporium Ribis* (Lib.) Mont. & Desm.

Gooseberry.—Powdery Mildew, *Sphaerotheca Mors-uvae* (Schw.) B. & C.,; Leaf Spot, Rust, *Septoria Ribis*, Desm.

Grape.—Anthracnose, Bird's-Eye Rot, *Gloeosporium ampelophagum* Sacc. (*Sphaceloma Ampelinum* De Bary.); Black Rot, *Guignardia Bidwellii* (Ell.) Viala

& Rav.; Downy Mildew, Brown Rot, Gray Rot, *Plasmopara Viticola* (B. & C.) Berl. = (*Peronospora viticola* De Bary.); Leaf Blight, *Cercospora Viticola* Sacc.; Powdery Mildew, *Uncinula necator* (Schw.) Burr.

PEACH.—Brown Rot, Ripe Rot, *Sclerotinia fructigena* (Pers.) Schrt. = (*Monilia fructigena* Pers.); Mildew, *Sphaerotheca pannosa* (Wallr.) Lév.; Leaf Curl, *Exoascus deformans* (Berk), Fuckel.; Black Spot, *Cladosporium carpophilum* Thüm; Yellows.

PEAR.—Core Rot; Leaf Blight, Pear Cracking, *Entomosporium maculatum* Lév.; Fire Blight, *Bacillus amylovorus* (Burr.) De Toni.

PLUM.—Shot-hole Fungus, *Cylindrosporium Padi* Karst.; Brown Rot, Ripe Rot, *Sclerotinia fructigena* (Pers.) Schart. (*Monilia fructigena* Pers.); Pockets, *Exoascus Pruni* Fuckel; Spot or Blight of the Native Plum, *Cladosporium carpophilum* Thüm.: Black Knot, *Plowrightia morbosa* (Schw.) Sacc.

RASPBERRY.—Anthracnose, Cane Rust, *Gloeosporium Venetum* Speg; Orange Rust, *Gymnoconia Peckiana* (Howe) Tranz. (*Cæoma nitens* Schw.); Cane Blight, *Coniothyrium* (Fckl.) Sacc.; Leaf Spot, *Septoria Rubi* West; Yellows.

STRAWBERRY.—Leaf Blight, Rust, *Mycosphaerella Fragariæ* (Tul.), Lindau (*Sphaerella Fragariae* Sacc.); Powdery Mildew, (*Spaerotheca Humuli* DeC. (*Sphaerotheca Castagnei* Lév.)

Vegetables.

ASPARAGUS.—Rust, *Puccinia Asparagi* De C.

BEAN.—Anthracnose, *Colletotrichum Lindemuthianum* (Sacc. & Magn.) Scribner.

CABBAGE.—Black Rot, *Pseudomonas campestris* (Pammel), Erw. Smith

CELERY.—Leaf Spot, Leaf Blight, Early Blight, *Cercospora Apii* Fr.; Late Blight. Rust, *Septoria Petroselini* Desm. var. *Apii* Br. & Cav.

ONION.—Blight, Downy Mildew, *Peronospora Schleideniana* De Bary.

POTATO.—Early Blight, Leaf Blight, *Alternaria Solani* (E. & M.) Jones & Grant; Late Blight, Rot, *Phytophthora infestans* (Mont.) De Bary; Scab, *Oospora scabies* Thaxter.

TOMATO.—Black Rot, *Macrosporium tomato*, Cooke.

Flowers.

CARNATION.—Rust *Uromyces caryophyllinus* (Schrank) Wint.

IRIS.—*Heterosporium gracile* Sacc.

ROSE.—*Mucor.*

VIOLET.—Leaf Blight, Leaf Spot, *Cercospora Violae* Sacc.

Fungous Parasite of San José Scale, *Sphaerophila coccophila.*

SEEDLING FRUITS OF CANADIAN ORIGIN RECEIVED FOR EXAMINATION DURING 1909-10.

There was quite a number of seedling fruits received for examination during 1909-10, although the proportion of promising seedlings was less than usual. Descriptions were made of nearly all the fruits which were received. In the following table

the descriptions of the least promising are given in part, while, following the table, fuller descriptions are published of those considered most promising.

The Horticulturist will be glad to examine and report upon seedlings thought to have decided merit, but, as there are so many good named varieties now on the market, a new seedling must have some outstanding advantages over the older sorts to be considered promising. While new seedlings may be no better than the named varieties in most respects, they may be hardier, which would make them promising for the colder sections:—

SEEDLING FRUITS RECEIVED FOR EXAMINATION IN 1908-9.

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
449	Nova Scotia.	W. C. Douglas, Alma...	See full description.
450	" ..	E. K. Leonard, Paradise	Above medium size; roundish conical, slightly ribbed; pale green splashed and washed with dull red; subacid, little flavour; quality above medium; season October. Not promising.
451	" ..	" " ..	See full description.
452	" ..	R. M. McRae, West Bay	Crab apple; medium size; oblate, flattened at ends; rich yellow, subacid; slightly astringent, little flavour; quality medium. Season evidently mid to late September. Does not compare favourably with best named crab apples.
453	New Brunswick.	Tappan Adney, Upper Woodstock.	No. 1—Below medium size; roundish, very slightly ribbed; yellow well washed with orange red and purplish red; subacid, little flavour; quality medium; season probably early to late winter. Not specially promising.
454	" ..	" " ..	No. 2—Below medium size; oblate to roundish; yellow washed with orange red and dark purplish red splashes briskly subacid, slightly astringent, little flavour; quality;medium; season evidently early to late winter. Not specially promising.
455	" ..	" " ..	No. 3—Medium size; oblate to roundish, slightly ribbed; yellow splashed and washed with orange red with darker purplish red splashes; subacid, pleasant, but not high flavoured; quality above medium; season evidently early to late winter. Not specially promising.
456	" ..	C. H. Palmer, Middle Simonds.	No.1—Medium size; roundish; pale yellow, sometimes with a faint pink blush on sunny side; acid, little flavour; quality medium; season evidently October. Not promising.
457	" ..	" " ..	No.2.—Medium size; oblate; pale greenish-yellow thinly splashed with purplish red; briskly subacid, little flavour; quality medium; season probably late October to December. Not promising.
458	Quebec. ...	Jos. Cloutier, Riviere aux Chiens.	Large; roundish, ribbed; greenish-yellow with a pinkish blush on sunny side; briskly subacid, somewhat astringent, little flavour; quality medium; season probably late September to mid October. Grown by Joseph Simard, Beaupré, Que. Not promising.
459	"	Thos. Graham, Wyman..	Medium size; roundish; yellow, splashed and streaked with bright red; subacid, pleasant but not high flavour; quality above medium to good; season probably October. Not sufficiently promising.
460	"	G. D. Hodgson, Hudson.	Large, roundish conical; slightly ribbed; greenish-yellow washed with deep-purplish red and splashed with dark crimson; briskly subacid, little flavour; quality medium; season late October, probably to December. Not promising.
461	"	" ..	Medium size; roundish, slightly ribbed; very dark crimson; subacid, flavour somewhat Fameuse-like; quality above medium; season evidently late October to early or mid winter. Not good enough in quality.
462	"	N. Jean, L'Ange Gardien, Montmorency Co.	Small, roundish, regular; yellow, well washed with dark crimson; subacid, pleasant but not high flavour; quality good; season probably late October to December. Too small.
463	"	Jules Lagacé, St. Louis Church, Témiscouata.	Below medium size; roundish; pale greenish-yellow with a dull red blush on sunny side; subacid, little flavour; quality medium; season evidently late October, probably through November. Not sufficiently promising.

SEEDLING FRUITS RECEIVED FOR EXAMINATION IN 1908-9 —*Continued.*

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
464	Quebec....	Hugh McLatchie, West Templeton.	Below medium to medium, roundish; pale, waxy-yellow well splashed and streaked with bright red; briskly subacid; little flavour; quality above medium. Season mid to late August. Attractive but rather small.
465	"	Peter Reid, Chateauguay Basin.	Medium size; roundish; pale, greenish-yellow, splashed and washed with crimson; subacid, pleasant flavour; quality good; season evidently early October.
466	"	Peter Reid, Chateauguay Basin.	Above medium size; oblate conic; pale green washed with deep crimson; subacid, peculiar flavour; quality above medium; season October. Peculiar flavour is against it.
467	"	J. A. Roussin, Oka....	Above medium size; conical; yellow, splashed and streaked with purplish-red; subacid, pleasant but not high flavour; quality above medium; season evidently mid to late September. Not sufficiently promising.
468	Ontario....	H. C. Aikman, Washago.	Large; roundish; pale green, thinly splashed and washed with carmine; subacid, little flavour; quality above medium; season probably October. Not attractive enough nor good enough in quality.
469	"	Wm. Bishop, Guelph....	See full description.
470	" ...	John Dunlop, Union Hall.	See full description.
471	"	H. Hilborn, Bosworth...	Medium size; roundish; yellow, splashed and washed with carmine; subacid, pleasant flavour, quality good; season October. Water-cores. Not promising.
472	" ...	Wm. Hutchings, sr., Haliburton.	Below medium size; roundish; pale yellow, washed and splashed with crimson; subacid, pleasant, not high flavour; quality above medium; season evidently November. Not promising except perhaps locally.
473	"	Wm. Hutchings, Haliburton.	Below medium size; oblate conic; yellow; washed with pinkish red on sunny side; sweet, but not high flavour; quality above medium; season evidently November to late winter. Not promising except for where better kinds will not succeed.
474	" ...	W. J. Kerr, Ottawa.....	Above medium size; oblate conic; pale green splashed and washed with deep crimson; briskly subacid, little flavour; quality medium; season early to late September. Quality not good enough.
475	"	Wm. Loney, Kenmore..	Medium to above medium size; oblate, flattened; pale greenish yellow, sometimes with a trace of pinkish-red on sunny side; subacid, sprightly, slightly astringent; quality above medium; season evidently late November to probably through the winter. Not attractive enough in appearance, nor good enough in quality.
476	" ...	John McKay, Creemore.	See full description.
477	"	John McKay, Creemore.	Medium size; roundish; pale, greenish-yellow washed and splashed with crimson; subacid, pleasant; quality above medium to good; season November and December. Not as good as No. 476.
478	" ...	John McKay, Creemore.	Below medium size; roundish conic; green; subacid, little flavour; quality medium to above medium; season late November and later. Not promising.
479	"	Edwin Peart, Nelson....	'Homestead.' See full description.
480	"	Dr. Geo. Sherk, Cheapside.	'Euphemia.' Medium size; oblate ribbed; greenish yellow, splashed and striped with red on sunny side; acid, little flavour; quality medium to above medium; season evidently September. Not promising.
481	" ..	Dr. Geo. Sherk, Cheapside.	'Mary'. Large; roundish conic; pale yellow, almost entirely covered with crimson; briskly subacid, pleasant but somewhat astringent; quality above medium to good; season evidently early September. Astringency is against it.
482	" ..	Dr. Geo. Sherk, Cheapside.	'Harriette'. Medium size; roundish; greenish-yellow washed with crimson on sunny side; subacid, little flavour; quality above medium; season probably late September to November or later. Not sufficiently promising.

SEEDLING FRUITS RECEIVED FOR EXAMINATION IN 1908-9.—*Concluded.*

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
483	Ontario. ..	C. L. Stephens, Orillia..	No. 1. Above medium size; oblate conic; greenish-yellow or yellow, well splashed and washed with carmine; briskly subacid, pleasant flavour but astringent: quality above medium; season September and later. Not sufficiently promising.
484	" ..	C. L. Stephens, Orillia..	Medium size; roundish conical, ribbed; yellow, pinkish on sunny side; briskly subacid, not high flavour; quality above medium; season mid to late winter. Not juicy enough nor good enough in quality.
485	" ..	J. Woodhouse, Guelph	See full description.
486	" ..	J. Woodhouse, Guelph..	Medium; roundish; green, washed with dull bronzy red on sunny side, subacid, pleasant flavour; quality above medium to good. Season evidently late November through the winter. Not good enough in quality nor attractive.
487	" ..	Mrs. Wm. Cummings, Spencerville.	See full description.
488	" ..	H. A. McIntosh, Dundela.	See full description.
489	British Columbia.	W. G. Barclay, Nelson..	Large; oblate conic, sides unequal, pale yellow, thinly splashed with purplish red on sunny side; briskly subacid, little flavour; quality above medium; season evidently September to early October. Past best condition, but does not seem good enough in quality.
490	" ..	W. S. Clark, Keefers....	No. 1. Very large; roundish conical, ribbed; pale green washed with dull red; sweet: quality medium to above medium; season evidently October. Not of especial merit.
491	" ..	W. S. Clark, Keefers....	No. 2. Medium; oblong conical, flattened at apex; yellow, splashed and streaked with carmine; briskly subacid, little flavour; quality medium; season evidently October. Not promising.
			PLUMS.
492	Quebec.	Slack Bros., Waterloo...	Below medium size; yellow nearly covered with red. A very late variety. Past best condition. Nigra group.
493	Ontario......	A. D. Harkness, Irena..	See full description.
494	" ..	L. L. Livingston, Frankville.	Two seedlings, neither of which was promising. Americana group.
495	" ..	R. A. Marrison, Cataraqui	Kingston Sugar. See full description.
496	" ..	C. H. Snow, Cummings Bridge.	Large; oval; yellow, more or less covered with bright red; clingstone; sweet but somewhat astringent; quality above medium. Attractive, but too astringent to be promising. Americana group.
497	" ..	C. H. Snow, Cummings Bridge.	Seedling of Weaver. See full description.
498	" ..	C. H. Snow, Cummings Bridge.	Seedling of Hawkeye. Very large; roundish to oval, slightly flattened; yellow, sparingly splashed with bright red; sweet, somewhat astringent; quality above medium; attractive looking but not good enough in quality. Americana group.
499	" ..	A. E. Wilson, Clarence..	Medium size; roundish to somewhat heart-shaped; deep red all over. Moderately sweet and without astringency; quality above medium. Not specially promising but said to never blight. Nigra group.
			GOOSEBERRY.
500	Nova Scotia.	Peter Barret, Truro.....	Hortense. Size 1 to 1½ in. by ⅞ to 1 in; oval to roundish: green; a very few prickles; quality medium.

449. Apple, seedless, from W. C. Douglas, Alma, Pictou county, N.S.—Small; roundish to oblong; cavity medium depth and width, russeted; stem long, slender; basin open, medium depth, wrinkled; calyx open; pale yellow with a red blush on sunny side; predominant colour pale yellow; dots obscure; skin thin, tender; flesh dull white, tender, breaking; core medium size, normal; briskly subacid, little flavour, moderately juicy, slightly astringent; quality medium; season October, evidently.

Quite seedless, but does not seem abnormal in any other way. More of a crab apple than an apple. Tree said to be about 75 years old.

451. Apple, seedling from E. K. Leonard, Paradise, N.S.—Medium size; oblate to roundish; cavity deep, medium width; stem short, moderately stout; basin medium depth and width, slightly wrinkled; calyx open; pale yellow, well washed with bright crimson; predominant colour, bright crimson; dots few, yellow, distinct; skin moderately thick, moderately tender; flesh white, very tender, juicy; core medium; subacid, pleasant, not high flavour; quality above medium; season evidently October.

A handsome apple of the Fameuse type.

469. Apple, seedling from Wm. Bishop, Guelph, Ont.—Medium size; oblong conical; cavity medium depth and width; stem short, moderately stout; basin deep, medium width; calyx open; yellow; predominant colour yellow; seeds medium; dots moderately numerous, grey, distinct; skin thin, moderately tender; flesh yellowish, tender, juicy, buttery; core above medium size, open; subacid, pleasant flavour; quality good; season evidently November and December.

Said to be a seedling of Bellflower, and better in quality than parent. It is good in quality and perhaps better than Bellflower, but too much like it to make it promising for propagating as a new sort. Worthy of further test.

470. Apple, seedling from John Dunlop, Union Hall, Ont.—Medium size, roundish; cavity medium depth and width; stem medium length, moderately stout; basin medium depth and width, slightly wrinkled; calyx open; splashed, streaked and washed with dark crimson; predominant colour dark crimson; seeds above medium, plump; dots obscure; skin moderately thick, moderately tender; flesh yellowish, tender, moderately juicy; core medium; subacid, pleasant flavour; quality good; season evidently September to November.

Supposed to be a seedling of Duchess. Said to be very hardy. 'A better keeper than Duchess,' November 13. Past condition now; may be useful coming between Duchess and Wealthy.

476. Apple, seedling from John McKay, Creemore, Ont.—Medium size; roundish; cavity medium depth and width; stem short, stout; basin deep, medium width, wrinkled; calyx closed; pale greenish yellow washed and splashed with crimson; predominant colour crimson; seeds large, long; dots white, distinct; skin thick, tough; flesh dull white, rather coarse, but crisp and juicy; core below medium; subacid, pleasant flavour; quality good; season mid November, probably to mid-winter.

A promising apple if hardier than most winter sorts. Flavour is much like Spy.

479. Apple, seedling from Edwin Peart, Nelson, Ont.—Named 'Homestead;' large; roundish conical, ribbed; cavity open, deep, russeted at base; stem medium length, moderately stout; basin deep, medium width, nearly smooth; calyx open; yellow, washed and splashed with pinkish red and carmine; predominant colour carmine; seeds medium size, plump; dots few, small, white, distinct; skin moderately thick, tough; flesh yellowish, tender, melting, juicy; core medium; subacid, pleasant flavour, but after-taste peculiar; quality good; season evidently early to mid-winter.

Very much like Northern Spy in outward appearance, in flesh, and slightly in flavour, but general flavour is different from Spy; after-taste not altogether pleasant. Probably a seedling of Spy. Grown on farm of E. Peart, and fruited for the first time this year. Promising.

485. Apple, seedling from J. Woodhouse, Guelph, Ont.—Above medium size; roundish; cavity medium depth and width, russeted; stem short, stout; basin medium depth and width, smooth; calyx open; yellow washed with orange red on sunny side; predominant colour yellow; seeds large; dots moderately numerous, yellow, distinct on sunny side; skin moderately thick, tough; flesh yellowish, tender, moderately juicy; core medium; subacid, pleasant flavour; quality good; season evidently October and November.

Tree 10 years old. Bearing 3 years. Resembles Holland Pippin considerably. Handsome and rather promising.

487. Mrs. Wm. Cumming, Spencerville, Ont.—Medium size; oblate, cavity medium depth and width, russeted; stem medium length, slender; basin deep, medium width, smooth; calyx open; yellow washed and splashed with crimson; predominant colour, crimson; seeds medium size, broad; dots few, yellow, indistinct; skin thin, moderately tender; flesh dull white or yellowish, tender, breaking, juicy; core small; subacid, pleasant flavour; quality good to very good; season evidently mid-winter. Promising. Apple of Fameuse type.

488. Apple, seedling from H. A. McIntosh, Dundela, Ont.—Fruit, above medium size; oblong, conical, ribbed; cavity medium depth and width, russeted; stem short, stout; basin narrow, medium depth, wrinkled; calyx closed or partly open; yellow, well washed and splashed with rich crimson; predominant colour rich crimson; seeds numerous, above medium size; dots numerous, small, yellow, distinct; bloom, none on specimens examined; skin moderately thick, tough; flesh dull white or yellowish with traces of red, firm; moderately juicy; core large, open; flavour subacid, not high; quality above medium; season evidently mid to late winter.

Tree: Thought to be 'a cross between McIntosh and Salome.' Said to 'have the freshness and keeping quality of Salome, but a better bearer and tree as hardy as an oak.' An attractive looking apple, but not good enough in quality to be very promising.

493. Plum, seedling from A. D. Harkness, Irena, Ont.—Roundish to heart-shaped; medium size; cavity narrow, medium depth; suture distinct, slightly depressed; apex rounded; yellow, more or less washed with bright red; dots obscure; no bloom; skin moderately thick, tender; flesh yellow, juicy; stone medium size, oval, considerably flattened; flavour sweet, good, no astringency; quality good.

A good plum if larger. Nigra group.

495. Plum, Kingston Sugar, from R. A. Marrison, Cataraqui, Ont.—Heart-shaped; above medium size, 1½ by 1½ inches; cavity shallow, medium width; stem medium length; moderately stout; suture a distinct line, very slightly depressed; apex rounded; green with traces of yellow; dots indistinct; bloom moderate, bluish; skin moderately thick, moderately tough; flesh yellowish-green, juicy; stone medium size, oval, cling; flavour sweet, good; quality very good.

Said to be hardier than Lombard and some other sorts. A promising plum. Reine Claude group.

497. Plum, seedling of Weaver, from C. H. Snow, Cummings' Bridge, Ont.—Oval, slightly flattened; large; cavity shallow, open, suture a distinct line, not depressed; apex rounded; yellow, more or less washed with red; dots indistinct; bloom thin, bluish; skin thick, moderately tender; flesh yellow, juicy; stone medium size, oval, flattened, cling; flavour sweet, not rich, good; quality good.

A large attractive looking plum of good quality. Promising. Would be more promising if a freestone.

APPLES ORIGINATED IN THE HORTICULTURAL DIVISION.

In the last three annual reports, descriptions were published of 34 of the best varieties of apples which have been originated in the Horticultural Division, Central Experimental Farm, and 14 more are described in this report. Since the year 1897, many new seedling apples have been fruiting here. The first of these were of Russian parentage, the seed having been imported from north of Riga in Russia. Three thousand trees grown from this seed were set out in 1890 and began to fruit in 1897. Few of these proved of sufficient merit to propagate for use in Eastern Canada, but a number are being tested in the prairie provinces on account of their hardiness. In 1398, seed was saved of some of the best varieties of apples which fruited at Ottawa that year, and from this seed about 2,000 trees were raised and set out in the orchard. Of these, 523 have now fruited, 89 of which fruited for the first time in 1909. Among these are some very promising summer, autumn and winter apples. New seedlings of other sorts are being raised, which will be set out when large enough.

Some good varieties of apples have also been produced by cross-breeding in the Horticultural Division. In 1909, there were 417 cross-bred trees growing and there should be between 400 and 500 more young trees from the seed resulting from the crossing done in 1909.

In order to make the chances of obtaining desirable apples greater, quite a number of varieties have been used as parents, in most cases reciprocal crosses with the same varieties having been made, thus making many more combinations than the number of varieties might indicate. The varieties used as parents have been Anis, Anisim, Antonovka, Baxter, Bethel, Duchess, Dyer, Fameuse, Forest, Hibernal, Lawver, Lowland Raspberry, Malinda, Milwaukee, McIntosh, McMahan, Newton, Northern Spy, North Western Greening, Scott Winter, Stone, Winter Rose, Walton.

Following are descriptions, not hitherto published, of some of the most promising seedling apples originated in the Horticultural Division.

Anson (Winter St. Lawrence seedlings).—Medium size; roundish, slightly ribbed; cavity medium depth and width; stem short, stout; basin deep, narrow, wrinkled; calyx closed; pale yellow, almost white, thinly splashed and streaked with carmine; seeds medium; dots obscure; skin moderately thick, tough; flesh white, fine grained, tender, juicy; core medium; subacid, pleasant, Fameuse-like flavour; quality good to very good; season October, probably through November.

Resembles Winter St. Lawrence a little in flavour. Distinctly of the Fameuse group. Quite promising, season coming just before McIntosh and Fameuse.

Battle (Wealthy seedling).—Above medium to large; roundish conic; cavity deep, medium width; stem short to medium, stout; basin medium width, medium depth, almost smooth; calyx partly open or closed; pale, greenish-yellow well splashed and washed with bright purplish-red; dots few, yellow, distinct; skin moderately thick, tough; flesh white, tinged with red, firm, crisp, breaking, tender, rather coarse, juicy; briskly subacid, aromatic, raspberry-like flavour; core medium; quality good; season late August to early September; ripens before Duchess.

Handsome in appearance. Resembles Wealthy somewhat in outward appearance and flavour. Should make an excellent cooking apple and is good for dessert.

Brock (McIntosh seedling).—Large; roundish, slightly ribbed; cavity medium depth and width; stem short, stout; basin deep, medium width, slightly wrinkled; calyx closed; yellow, well splashed and washed with orange red; dots few, pale yellow, indistinct; skin moderately thick, tender; flesh yellowish, tender, moderately juicy; core medium, open; subacid, pleasant and vinous flavour; quality good; season mid-September to early October.

Does not resemble McIntosh except in having tender flesh. Propagate on account of large size, attractive appearance and good quality. Suggestive of Gravenstein in appearance and flavour.

COBALT (Lawver seedling).—Medium size; roundish; cavity medium depth and width; stem long, slender; basin medium depth and width, slightly wrinkled; calyx partly open; pale yellowish-green, thinly splashed and washed nearly all over with pinkish-red; dots few, small, distinct, whitish; skin moderately thick, moderately tough; flesh firm, crisp, tender, dull white or yellowish; core medium; briskly subacid, pleasant, aromatic flavour; quality good; season mid to late winter.

Resembles Spy very much in outward appearance, flesh and flavour. Promising.

HERALD (Fameuse seedling).—Medium size; roundish; cavity deep, open; stem medium length, moderately stout; basin deep, open, wrinkled; calyx closed; pale yellow, washed and splashed with crimson; predominant colour crimson; dots few, pale, indistinct; skin moderately thick, moderately tender; flesh dull white, tender, juicy; core small; subacid, good, Fameuse-like flavour; quality good to very good; season evidently November and perhaps later.

Resembles Fameuse somewhat in outward appearance and very much in flavour. Promising.

HOMER (Northern Spy seedling).—Large; roundish conical; slightly ribbed; cavity deep, medium width; stem medium length, moderately stout; basin medium depth and width, wrinkled; calyx closed; pale yellow, thinly splashed and washed, mostly on sunny side, with bright carmine; seeds medium size, broad; dots few, small, pale yellow, indistinct; skin moderately thick, moderately tough; flesh dull white or yellowish, buttery, moderately juicy; core medium size, open; subacid, pleasant, Spy-like flavour; quality good; season October, probably to mid-winter.

A promising apple resembling Spy in shape, outward appearance, flesh and flavour.

LOBO (McIntosh seedling).—Above medium size; roundish conical; cavity medium depth, open, sometimes russeted; stem short to medium, stout; basin deep, narrow, almost smooth; calyx open; pale yellow, almost white, washed with bright crimson; predominant colour bright crimson; seeds medium; dots moderately numerous, grey, indistinct; bloom little, if any; skin thick, tough; flesh white with traces of red, fine grained, tender, juicy; core medium, subacid, sprightly, pleasant, not high, flavour; quality good; season October.

Resembles McIntosh considerably in outward appearance, in flesh and in flavour. Promising.

MELVIN (Wealthy seedling).—Medium size; roundish; cavity deep, medium width, sometimes lipped, slightly russeted; stem medium to long, slender to moderately stout; basin medium depth and width, smooth; calyx open or partly open; pale yellow, well splashed and washed with rather dull red, but attractive; dots few, pale, distinct; skin thin, tough; flesh yellow with traces of red near skin, very tender, melting; core medium; briskly subacid, spicy, good flavour; quality good; season middle to end of August.

Considerably like Sops of Wine in outward appearance and quality, but juicier and of much better quality. Also resembles Wealthy somewhat in outward appearance and in aromatic flavour.

NEPEAN (Salome seedling).—Above medium to large; oblong, angular; cavity deep, medium width; stem medium length, moderately stout; basin open, medium depth, slightly wrinkled; calyx open or partly open; greenish-yellow, well washed and splashed with bright pinkish-red; dots moderately numerous, grey, indistinct; bloom thin, pink; skin moderately thick, tough; flesh yellowish, tender, buttery, moderately

juicy; core large, subacid, pleasant flavour; quality above medium to good; season mid-November probably to middle or late winter.

Resembles Salome very much in outward appearance, flesh and flavour.

OSWALD (Salome seedling).—Medium to above in size; roundish conic, slightly ribbed; cavity medium depth and width; stem medium length, moderately stout; basin narrow, medium depth, wrinkled; calyx closed; pale yellow, washed and splashed with bright pinkish-red and purplish-red; dots moderately numerous, white, indistinct or merging into colour; bloom pinkish; skin moderately thick, moderately tough; flesh yellowish, crisp, tender, juicy; core large, open; subacid, pleasant flavour; quality good; season late September, October.

Resembles Salome somewhat in outward appearance. Very handsome.

PETREL (Shiawassee Beauty seedling).—Above medium size; roundish; medium depth and width; stem short to medium, stout; basin open, deep, wrinkled; calyx open; pale, greenish-yellow, splashed and washed with carmine; dots few, indistinct; skin thin, tender; flesh white, tender, breaking, juicy; core medium; subacid, pleasant flavour; quality good; season early September.

This is a good dessert apple though not very attractive in appearance. Resembles Shiawassee only somewhat in flesh. Resembles St. Lawrence in flavour. A good dessert apple.

PROSPER (Wealthy seedling).—Above medium size; roundish; cavity deep, medium width, russeted at base; stem short, stout; basin deep, medium width, slightly russeted; calyx open; yellow, well washed with crimson; dots numerous, yellow, distinct; skin moderately thick, moderately tough; flesh yellowish, rather coarse, tender, moderately juicy; core medium, subacid, pleasant flavour; quality good; season December probably to late winter.

Promising, propagate. Resembles Wealthy considerably in outward appearance and in character of flesh.

ROULEAU (Salome seedling).—Large, oblong, slightly ribbed; cavity medium depth, open; stem short to medium, moderately stout; basin deep, medium width, almost smooth; calyx closed or partly open; pale, greenish-yellow, splashed and washed with pinkish red; predominant colour pinkish-red; seeds medium; dots few, pale yellow, distinct; skin moderately thick, tender; flesh dull white or yellowish, crisp, tender, moderately juicy; core medium size, open; briskly subacid, pleasant, not high, flavour; quality above medium to good; season late November, probably to mid or late winter.

Resembles Salome considerably in outward appearance and a little in flesh and core. Promising.

STELLA (Salome seedling).—Above medium size; roundish conical; cavity deep, open; stem short, stout; basin open, moderately deep, wrinkled; calyx open; pale yellow well washed on sunny side and about apex with orange, red and pinkish-red; dots few, pale yellow, indistinct; skin moderately thick, moderately tender; flesh yellowish, crisp, tender, buttery, moderately juicy; core above medium, open; subacid, pleasant flavour; quality good; season late September, October.

Resembles Salome somewhat in character of flesh and flavour and a little in colour.

A WEALTHY APPLE ORCHARD—CLOSELY PLANTED.

In the annual reports for 1902, 1904, 1905 and 1908 an account is given of a small closely-planted orchard of Wealthy apple trees, and, as the returns from this little orchard are watched with considerable interest by fruit growers, the history of it is

Nursery where new varieties of apples are propagated, Central Experimental Farm, Ottawa. *Photo by F. T. Shutt.*

continued in this report. This orchard was planted in 1896 and occupies about one-third, 40/121, of an acre. The trees were originally ten by ten feet apart, or at the rate of 435 trees per acre. A few of them have died and, in 1907, when the trees were thought to be too close in places, 7 were removed, and, in 1909, 12 were taken out. Of those removed in 1909, 8 were taken off one end of the orchard in the spring to leave room for a street car line. The original number of trees was 144; of these, 108 remain. In the spring of 1905, about one-half of the trees were headed back severely to admit more light and air; the other half were treated the same the following year. The trees are pruned moderately every year. The orchard is in sod, but, as the trees are so close, it is not thick. The grass is cut and left to lie in the orchard. As the trees are too close to take a spray pump into the orchard, a long hose is used, which is taken in from each side.

Most of the trees remaining in this orchard are healthy and vigorous and promise to give for some time returns as good as, or better than, they have in past seasons.

Following is a statement of yields, sales, expenses and profits from the time the orchard was planted to the end of 1909:—

WEALTHY ORCHARD, 1896-1909.

Net profit per acre, 1896-1904	$487 16
" " 1905	103 13
" " 1906	112 80
" " 1907	37 54
" " 1908	104 34
" " 1909	108 98
Total net profit per acre, 1896-1909	$953 95
Average net profit per acre from date of planting, 1896 to 1909	$ 68 14
Average net profit per acre from date of fruiting, 1899 to 1909	100 36

WEALTHY ORCHARD, 1908.

	Gallons.
Fruit picked	630¾
Windfalls	678½
Total	1,309¼

SALES OF FRUIT FROM CLOSELY PLANTED WEALTHY ORCHARD, 1908.

		Estimated per acre.
100 baskets at 20c.	$20 00	$ 60 50
10 " 23c.	2 30	6 96
40 " 23¾c.	9 50	28 74
265 " 25c.	66 25	200 40
16 " 27½c.	4 40	13 31
12 " 30c.	3 60	10 89
443 baskets.	$106 05	$320 80

EXPENSES, 1908.

		Estimated per acre.
Mowing, 1 man, 10 hours at 15c. per hour	$ 1 50	$ 4 54
Spraying, 4 times	3 00	9 07
Material used for spraying, poisoned Bordeaux mixture, 7 barrels at 30c.	2 10	6 35
Cost of baskets and covers at $4 per 100	17 72	53 60
Commission on sales	10 65	32 22
Rent of land	0 99	3 00
Picking fruit, 93 hours at 16⅔c. per hour	15 50	46 89
Packing fruit, 78 hours at 16⅔c. per hour	13 00	39 32
Putting on tree protectors	1 50	4 54
Manure, 4 loads at 40c., teamster with team, $1	5 60	16 94
Total expenses	$71 56	$216 47
Net profit, 1908	34 49	104 33

WEALTHY ORCHARD, 1909.

	Gallons.
Fruit picked	745½
Windfalls	748
Total	1,493½

SALES OF FRUIT FROM CLOSELY PLANTED WEALTHY ORCHARD, 1909.

				Estimated per acre.
Sold—115	baskets at	15c.	$ 17 25	$ 52 18
5	"	17½c.	0 87½	2 64
139	"	20c.	27 80	84 09
225	"	25c.	56 25	170 15
20	"	27½c.	5 50	16 66
Total 504	baskets		$107 67½	$325 72

EXPENSES, 1909.

		Estimated per acre.
Mowing, 1 man, 10 hours at 15c. per hour	$ 1 50	$ 4 54
Pruning, 1 man, 30 hours at 15c.	4 50	13 61
Spraying, 4 times	3 00	9 07
Material used for spraying, poisoned Bordeaux mixture, 5 barrels at 24c.	1 20	3 63
Cost of 504 baskets and covers at 4c. each	20 16	60 98
Putting on tree protectors, 1 man, 10 hours at 15c. per hour	1 50	4 54
Rent of land	0 99	3 00
Commission on sales of fruit	7 14	21 60
Picking fruit and gathering windfalls, 98 hours at 16⅔c. per hour	16 33	49 40
Packing fruit, 56 hours at 16⅔c. per hour	9 33	28 22
Packing fruit, 40 hours at 15c. per hour	6 00	18 15
Total expenses	$71 65	$216 74
Net profit, 1909	36 02½	108 98

The above yields, receipts and expenses are estimated from about one-third of an acre (40/121) although in future the area will be a little less on account of removal of one outside row of trees. The estimated figures per acre are given on the assumption that the percentage of sales would be the same from a full acre. A record is kept of the time spent in caring for this orchard. Labour is valued at 15c. per hour.

Close planting, such as is here reported upon, is not recommended for the average farmer, but, for men whose main business is fruit growing, it promises to be a more remunerative method for growing early-bearing varieties than planting them at the regular distances of thirty to thirty-six feet apart. It will probably pay better to plant trees closely in the colder than in the warmer districts. A method of close planting suggested for the best apple districts is to have the permanent trees thirty-six to forty feet apart each way, with early bearing varieties between and with additional rows of such between the permanent rows, making all the trees eighteen to twenty feet apart each way at the beginning, with the intention of cutting out the early bearing sorts in fifteen to twenty years.

Several early-bearing varieties in addition to the Wealthy are being tested at the Central Experimental Farm to see how they will succeed when planted closely.

PLUMS.

There was a medium crop of plums in 1909. The fruit was mainly from trees of the *Americana* and *Nigra* groups, most of the fruit buds of the European plums having being winter-killed, as usual. Notwithstanding spraying with Bordeaux mixture, the Shothole fungus seriously affected the foliage of many varieties of *Americana* plums, the result being that the fruit was not as large as it otherwise would have been. Considerable fruit burst this year during the ripening season as there was showery weather at that time. Trees which were heavily loaded were thinned by hand as in the previous year.

Many new varieties of *Americana* plums are being tested and seedlings are being grown here, of which some have been named and described in previous reports. The most promising new plum which fruited this year is Omaha, of which the following description was made:—

Omaha (*P. Americana x P. triflora*): Originated by Theodore Williams, Benson, Nebraska.

Tree hardy, a strong grower and productive. Fruit buds hardy. Fruit roundish, almost round; as large as largest *Americana,* $1\frac{1}{2}$ by $1\frac{1}{2}$ inches; cavity narrow, medium depth; stem short, $\frac{5}{8}$-ins., moderately stout; suture an indistinct line, little, if any, depressed; apex rounded; yellow, entirely or almost entirely covered with attractive red; dots numerous, small, distinct; bloom bluish; skin moderately thick, tough; flesh yellow, juicy, tender; stone medium size, oval, cling; flavour sweet, good except next stone and skin, where acid; quality good except next skin.

Appears to be a blend of *Americana* and Japanese. Fruit has perfume of Japanese. Foliage of tree somewhat like Japanese.

Another good new plum is Yuteca.

Yuteca (seedling of *P. Americana*): Originated by N. E. Hansen, Brookings, S.D.

Tree hardy and a strong grower. Fruit roundish, large; cavity medium width, shallow; stem long, slender; suture an indistinct line, not depressed; apex rounded; yellow, almost covered with lively crimson; dots numerous, yellow, distinct; bloom moderate, bluish; skin thick, moderately tough; flesh yellow, firm, juicy; stone medium size, roundish, semi-cling; flavour sweet, rich; quality good. *Americana* group.

An attractive looking plum of good quality. Rather promising.

CHERRIES.

The crop of cherries was an almost total failure in 1909. The fruit buds were killed by the winter. The varieties having the hardiest buds have been found to be Orel 25 and Vladimir.

GRAPES.

The crop of grapes in 1909 was a good one as far as quantity of fruit was concerned, but, although 53 varieties ripened, they were not as thoroughly ripe nor as sweet as in some years, the season being a comparatively cool one. The reason why so many varieties ripened notwithstanding the coolness was that there was no frost to cause any injury to grapes until October 20.

SMALL FRUITS.

The crops of raspberries, currants and gooseberries were good in 1909. Owing to the good covering of snow there was little winter injury except to those fruits which are always more or less injured by winter here. Among the newer bush fruits, four promising varieties are the Ruby red raspberry, the Gibraltar black raspberry, the Boskoop Giant black currant and the Perfection red currant. The strawberry crop was a medium one. Few of the newer named varieties were of special promise. The Island King, an early variety of good quality, may prove desirable. Some very fine seedlings originated at the Central Experimental Farm are being tested, and a few of these promised well in 1909.

VEGETABLES.

SWEET CORN—EARLIEST VARIETIES.

There are so many parts of Canada where the season is comparatively short that it is important for the farmer and market gardener to know which are the earliest varieties of sweet corn. Each year a number of early, medium and late sorts are tested at the Central Experimental Farm and notes are taken of the date when ready for use, the yield of marketable ears, the length of the ears, and the height to which the corn grows. These particulars are given in the following table of the six varieties found to be the earliest during the past three years:—

VEGETABLES.

SWEET CORN.—EARLIEST VARIETIES.

Variety.	Date ready for use, 1909.	Average date ready for use, 3 years 1907-9.	Yield of marketable ears from 12 hills, 1909.	Average yield of marketable ears from 12 hills, 3 years 1907-09.	Average length of ear, 3 years 1907-9.	Height 1909.		Quality.
					In.	Ft.	in.	
Malakoff	Aug. 15.	Aug. 12...	68	64	5	5	4	Very good.
Early Cory..........	" 17.	" 14...	55	63	6½	6	6	Above medium.
Peep O' Day........	" 15.	" 13...	63	59	5½	6	0	Good.
Early Fordhook.....	" 17.	" 16...	69	54	6	6	6	"
Dreer's Aristocrat...	" 17.	" 15...	50	48	6⅓	6	0	"
Pocahontas	" 20.	" 15...	45	39	6½	6	4	Above medium.

The Malakoff corn is decidedly the earliest variety grown; some years the earliness is more marked than in the above table, in 1907 it being a week earlier than Early Cory. It is the best in quality of the six varieties and the most productive. Its fault lies in the shortness of the ears, but for home use this is not so important as for market. At the Experimental Farm, an endeavour is being made to improve the size of the ear by selection. The Malakoff corn is, we believe, the best to plant in the coldest parts of Canada where corn will develop.

Of the six varieties, Pocahontas has the best ears, for, while no longer than Early Cory, they are thicker. It will be noticed, however, that the yield of the Pocahontas is much less than Early Cory; nor has it proved quite so early at the Experimental Farm. The Early Cory still leads as a productive early sweet corn, although the ears of the Early Fordhook are more uniform and it is a little better in quality than Cory. While the above table shows the Early Fordhook to be a day later in the average of the past three years, an average of a longer period would show it as early as Cory. Dreer's Aristocrat is better in quality than either Early Fordhook or Early Cory, but not so productive. Peep O' Day is much like Malakoff and is a good extra early variety for home use.

Two other very early varieties which have been tested recently are the Devitt's Early and Early Iowa. These are about the same in season as Early Cory. The Devitt's Early is a little too slender in the ear for a desirable variety. Other early sorts tested and not continued are Ford's Early, Lackey's Early, Ringleader and Early Windsor.

The Golden Bantam corn, a second early sort, is of very good quality and productive and should be planted to succeed the earliest sorts. August 19 is the average date when it is ready for use.

GARDEN PEAS—BEST VARIETIES.

Every year a large number of varieties of garden peas are grown in the Horticultural Division, although, during recent years, there have not been nearly so many as formerly. Most of the varieties are grown in a single row, each 30 feet in length. Notes are taken on these each year and the new ones are compared with the old. In 1909 there were 74 varieties under test. During the past ten years some of the best have been grown in rows 100 feet in length and three feet apart, 1,200 peas of each variety being planted. The best varieties are considered to be those which do not need to be staked, are productive and are good to very good in quality. In the following table will be found seventeen of the most satisfactory sorts during the past three years, with dates when they were ready for use, the yields, the length of the vines, the length of the pods and the quality. Owing to the coolness and moisture of the early part of the summer, the vines were longer than usual; the peas were also much later than the average in being ready for use. In ordinary seasons, none of the following varieties need support except Champion of England, which is included on account of its lateness and excellent quality.

GARDEN PEAS—BEST VARIETIES.

Name of Variety.	Date ready for use, 1909.	Average date ready for use, 1907-9.	Number of pickings, 1909.	Yield of green pods in 100 feet row, 1909.	Average yield of green pods in 100 feet row, 1907-9.	Length of vine, 1909.	Length of pods.	Quality.
				Quarts.	Quarts.	In.	In.	
Early—								
Gradus	July 13.	July 7.	3	44	30	30	3½	Very good.
Thos. Laxton	" 8.	" 5.	4	32	29	42	3	Good.
Exonian	" 8.	" 3.	5	33	28	42	2½	"
American Wonder	" 13.	" 7.	4	32	28	30	3	Very good.
Gregory's Surprise	" 8.	" 3.	5	43	27	32	2½	" "
Nott's Excelsior	" 9.	" 6.	5	29	24	28	3	" "
Second Early—								
Excelsior (Sutton's)	" 13.	" 8.	3	40	30	20	3¾	Very good.
English Wonder	" 14	" 8.	3	23	29	28	2¾	Good.
Premium Gem	" 14.	" 7.	4	25	24	41	3	Very good.
Medium—								
McLean's Advancer	" 19.	" 15.	5	42	41	42	3¼	Very good.
Burpee's Quantity	" 17.	" 13.	3	31	40	57	3¼	Good.
McLean's Little Gem	" 16.	" 10.	3	25	30	48	3	Very good.
Medium late to late—								
Heroine	" 22.	" 18.	4	35	40	38	4¼	Very good.
Market Master	" 18.	" 17.	4	52	36	32	4¼	Good.
Stratagem	" 22.	" 20.	5	39	34	36	4	Very good.
Juno	" 24.	" 18.	4	33	33	30	3	Good.
Champion of England	" 25.	" 21.	3	24	31	77	3	Very good.

A good succession of garden peas of the best quality could be had by planting, on the same date, Gregory's Surprise, Gradus, Excelsior, McLean's Little Gem, McLean's Advancer, Heroine, Stratagem and Champion of England. This will be found more satisfactory than making successive sowings of one variety.

One of the most promising of the newer varieties is Sutton's Early Giant, it being four days later in season than Gradus, in 1909, and rather similar to the latter in growth and pod.

TOMATOES—12 EARLIEST VARIETIES, 1909.

Except in those districts where tomatoes are grown for the canning factories, earliness in tomatoes is more important than high total yield. The varieties which give the largest crop of fruit in the early part of the season when the prices are high are the varieties which will prove the most profitable. Moreover, there is a large part of Canada where the season is comparatively short, and it is very desirable when growing tomatoes for home use or market to grow the varieties which will ripen in the shortest time. Each year a considerable number of varieties are grown side by side at the Central Experimental Farm, and a record is kept of the time when they are ripe and the quantity of fruit gathered at each picking. In the following table will be found the twelve varieties which proved the earliest in 1909:—

TOMATOES.—EARLIEST VARIETIES.

Name of Variety.	Date of First Ripe Fruit, 1909.	Yield of Ripe Fruit to Aug. 9, 1909.		Estimated Yield per Acre of Ripe Fruit to Aug. 9, 1909.	Total Yield of Ripe Fruit from all pickings—five plants, 1909.		Estimated Total Yield of Ripe Fruit per Acre, 1909.	Remarks.
		Lb.	Oz.	Lb.	Lb.	Oz.	Lb.	
Sparks' Earliana, (C.E.F. strain).	July 27	7	2	3879	74	2	40361	Medium size, scarlet, almost smooth.
Jack Rose.	" 26	6	7	3505	65	14	35868	Medium size, scarlet, almost smooth.
Earliest Pink	" 29	6	0	3267	58	0	31581	Medium size, purplish pink, semi-wrinkled.
Early Sunrise	Aug. 1	6	0	3267	69	4	37706	Below medium size, scarlet, smooth.
Sparks' Earliana (Johnson's No. 10 strain)	July 26	5	5	2892	63	7	34541	Medium size, scarlet, almost smooth.
June Pink	" 28	5	3	2824	66	7	36175	Medium size, purplish pink, smooth.
Nolt's Earliest	" 26	5	1	2756	77	5	42096	Medium size, scarlet, semi-wrinkled.
Sutton's A. I.	" 27	5	0	2722	58	14	32057	Medium size, scarlet, smooth.
I.X.L.	" 24	4	9	2484	45	5	24672	Medium size, scarlet, almost smooth.
Wealthy	" 28	4	0	2178	46	9	25353	Medium size, smooth, scarlet.
Sparks' Earliana, (Sunnybrook strain)	" 29	4	0	2178	76	8	41654	Medium size, scarlet, almost smooth.
Dominion Day	" 26	3	10	1973	63	6	34507	Medium size, scarlet, semi-wrinkled.

In the above table it will be noticed that there are three strains of Sparks' Earliana tomato. These are all considered as different varieties in this table, though under the same name. The Wealthy tomato resembles the Johnson's No. 10 strain of Sparks' Earliana. The Central Experimental Farm strain of Sparks' Earliana is the result of nine years' selection for earliness and six years' selection for the 'largest and most uniform crop of early fruit' from individual plants. It gave, in 1909, the largest crop of fruit up to August 9, when the prices were still high, and produced nearly the largest total crop of ripe fruit. Tested at the Horticultural Experiment Station at Jordan Harbour, Ont., in 1909, the C. E. F. strain yielded at the rate of $40 more ripe fruit per acre than five other early varieties which were tested, including three other strains of Sparks' Earliana.

For a variety to follow Sparks' Earliana, the Chalk's Early Jewel is probably the best. The Bonny Best is very much like it.

POTATOES.

The potato is one of the most important of food crops and on this account has always received marked attention at the Central Experimental Farm. Many experiments have been tried with the potato and the results have been published from time to time. At present the main experiments are the testing of varieties for comparisons of yield and earliness, spray tests, selection for immunity from Late Blight, tests to determine the value of 'change of seed,' improvement in the potato by methods advocated by the Canadian Seed Growers' Association.

The growing season of 1909 was a favourable one for potatoes and varieties of which new seed had been obtained in recent years did well. Most of the varieties under test, however, had been weakened in vitality by the dry summers of 1906, 1907 and 1908, and, although the season was favourable, some of these varieties did not yield one-fourth what they did in 1905 before the drought.

The potatoes in the uniform test plots were planted on May 19 in sandy loam soil. The crop the previous year was vegetables, the ground being well manured for them. The ground was ploughed in the spring and harrowed once with the disc harrow just before planting time. The drills were opened 30 inches apart with the double mould board plough. Sixty-six sets of each variety were planted. The sets were cut so that they would have at least three good eyes each, and were dropped one foot apart in the rows, and were covered with the hoe to ensure greater uniformity. The land was harrowed when the potatoes were coming up to destroy weeds and loosen the surface soil to conserve moisture. During the growing season the soil was cultivated seven times. At the last cultivation, a little soil was drawn towards the plants. Thus, almost level cultivation was adopted. The vines were sprayed with Bordeaux mixture four times and Paris green and arsenate of lead were used against the potato beetles.

The potatoes were dug on October 5. There was practically no scab or rot on the tubers. There were 112 varieties in the uniform test plots in 1909. Tables follow of the twelve varieties which have averaged highest in yield for the last five seasons and the thirty most productive sorts in the uniform test plots in 1909:—

TWELVE MOST PRODUCTIVE VARIETIES OF POTATOES.—AVERAGE OF FIVE YEARS.

Number.	Name of Variety.	Number of years under test without change of seed.	Season.	Colour.	Quality.	Average yield per acre, 1905–1909.	
						Bush.	lbs.
1	Dalmeny Beauty	6	Medium late	White	Good	290	50
2	Norcross	5	"	"	"	205	55
3	Carman No. 1	6	"	"	"	198	53
4	Rural Blush	21	Late	Pink and reddish	"	197	7
5	Dooley	9	Medium	White	"	194	2
6	Holborn Abundance	21	Late	"	Medium	179	31
7	Vick's Extra Early	17	Early	Pink and white	Good	176	53
8	Sabean's Elephant	15	Late	White	"	1[illegible]	53
9	Morgan Seedling	7	Medium	Pink and white	"	173	22
10	Canadian Beauty	12	"	"	"	172	29
11	Ash Leaf Kidney	6	" late	White	"	170	43
12	Crine's Lightning	8	Early	Pink with red eye	"	170	17

THIRTY MOST PRODUCTIVE VARIETIES IN UNIFORM PLOTS, 1909.

Number.	Name of Variety.	Total yield per Acre.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable.		Colour.
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
1	Sutton's Prolific	321	12	286	..	35	12	White.
2	Hard to Beat	310	12	286	..	24	12	"
3	King Edward	290	24	264	..	26	24	"
4	The Factor	266	12	246	24	19	48	"
5	New Reliance	255	12	217	48	37	24	Pink.
6	Dalmeny Beauty	244	12	222	12	22	..	White.
7	Snow	242	..	211	12	30	48	"
8	Barkley's Seedling	242	..	191	24	50	36	Pink.
9	White Giant	209	..	180	24	28	36	White.
10	King of Michigan	200	12	184	48	15	24	"
11	Uncle Gideon's Quick Lunch	198	..	162	48	35	12	Pink.
12	Early Petoskey	191	24	160	36	30	48	White.
13	The Cottar	184	48	145	12	39	36	"
14	Sutton's Sion House	182	36	140	48	41	48	"
15	Wellington	171	36	132	..	39	36	"
16	New Early Standard	162	48	132	..	30	48	"
17	Carman No. 1	158	24	140	48	17	36	"
18	Prince Albert	158	24	114	24	44	..	"
19	Planet	154	..	132	..	22	..	"
20	Norcross	151	48	127	36	24	12	"
21	Johnson's No. 2	151	48	123	12	28	36	"
22	Rural Blush	149	36	114	24	35	12	Pink and reddish.
23	Nebraska	145	12	110	..	35	12	White.
24	Gov. La Follette	143	..	90	12	52	48	"
25	Dewey	136	24	110	..	26	24	"
26	Imp. Early Ohio	129	48	92	24	37	24	Pink.
27	White Ohio	125	24	107	48	17	36	White.
28	Hick's Jubilee	125	24	94	36	30	48	"
29	Woodbury's White Rose	125	24	88	..	37	24	"
30	Canadian Red	123	12	85	58	37	24	Red.

TEN MOST PRODUCTIVE VARIETIES.—35 SETS PLANTED.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1	No. 2 from Smith Bros., Beachville, Ont	334	24	316	48	17	36
2	Seedling from W.E. Ferwell, Orillia, Ont.	277	12	242	—	35	12
3	King of All	264	—	246	24	17	36
4	Eldorado	242	—	237	36	4	24
5	May Wonder	211	12	162	48	48	24
6	Sutton's Superlative	189	12	167	12	22	—
7	Sharpe's Victor	189	12	167	12	22	—
8	Howard	167	12	145	12	22	—
9	Ten Dollar	162	48	145	12	17	36
10	Talisman	162	48	140	48	22	—

TEN MOST PRODUCTIVE VARIETIES.—16 AND 8 SETS PLANTED.

Number.	Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable	
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1	Mayfield Blossom	16	378	24	334	24	44	—
2	Prosperity	8	316	48	299	12	17	36
3	Michigan Rose	16	290	24	272	48	17	36
4	Dewdrop	8	281	36	228	48	52	48
5	Genesse Flat	16	264	—	255	12	8	48
6	Queen of Thanet	16	264	—	237	36	26	24
7	Fidler's Invincible	16	255	12	211	12	44	—
8	Fidler's Record	16	246	24	220	—	26	24
9	Harner's Delight	16	228	48	211	12	17	36
10	White Chief	8	228	48	193	36	35	12

POTATOES—TEST OF RESISTANCE TO BLIGHT.

In 1905, an experiment was begun to learn whether varieties of potatoes could be made more resistant to the Late Blight by selection. Varieties were chosen that year which for a number of years had shown greater resistance to disease than others. The experiment is being continued. Fifteen varieties were compared in 1909. Of these, four had been selected since 1905. Of these three gave a marked increased in the selected plot in 1909:—

POTATOES.—TEST OF RESISTANCE TO BLIGHT.

Name of Variety.	Total Yield per Acre Unselected 1909.		Total Yield per Acre Selected 1909.		Yield per Acre Marketable Unselected 1909.		Yield per Acre Marketable. Selected 1909.		Yield per Acre Unmarketable Unselected 1909.		Yield per Acre Unmarketable Selected 1909.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
State of Maine	101	12	154		74	48	132		26	24	22	
Carman No. 1	101	12	176		70	24	158	24	30	48	17	36
Holborn Abundance	127	36	127	36	105	36	105	36	22		22	
Dr. Maerker	180	24	220		132		189	12	48	24	30	48
Average	127	36	169	24	95	42	146	18	31	54	23	6
Average increase from selection	....		41	48	....		50	36				

In this test, the seed for the selected plots is obtained from the ten most productive hills from thirty-three hills planted. In another experiment, the Carman No. 1 variety is being selected from the produce of single plants each year, according to the rules of the Canadian Seed Growers' Association, but this work has not been continued long enough to report upon, although the results are very promising.

CHANGE OF SEED.

IMPORTANCE OF USING SEED OF STRONG VITALITY.

Up to the year 1906, the importance of the source of seed potatoes in Canada had not been strongly impressed upon the writer, although in the previous year, while on a visit to England, we were struck by the importance of it there. At the Experimental Farm we have been growing some varieties year after year from the same stock, grown on very similar sandy loam soil each year. Each year the best potatoes were selected for planting in the experimental plots and the results obtained seemed to justify the continuance of our own stock from year to year. Taking the results from four well-known varieties, for instance, the average yields were the following for the first four and the last four years in the sixteen years, 1890-1905, during which there was no change of seed.

Name of Variety.	1890–1893: Bushels per Acre.	1902–1905. Bushels per Acre.	Increase Bushels per Acre.
Early Rose	257	317	60
State of Maine	325	361	36
Empire State	301	338	37
Delaware	296	352	56

There was thus no indication of deterioration in the variety after sixteen years without a change of seed, but a fair increase, due, no doubt, to careful selection and good cultivation each year. But in the year 1906 there was a sudden change. That year was one of the most unfavourable seasons for potatoes that have ever been experienced at the Central Experimental Farm. During the early part of summer there was sufficient rain to keep the plants growing nicely, but just after the last cultivation, dry, hot weather set in and continued throughout the remainder of the growing season, with the result that the plants were stunted, the foliage dried up prematurely and there was a poor crop of tubers. Moreover, during the month of July there was a veritable plague of aphis which attacked the foliage and doubtless did their share in lessening the crop. The best tubers were used for seed in 1907, but the best were small and had been prematurely ripened in 1906. The early part of the summer of 1907 was dry and the tubers did not form well. The crop was again small, although most of the tubers which formed became of marketable size and were clean and well formed. The best of these tubers were used for seed in 1908, but, during that year, there was never enough moisture from the middle of June until the vines died, notwithstanding thorough cultivation. A severe attack of thrips also checked the growth of the vines. Again the best tubers were planted in 1909, and the seed used would have been considered by its appearance to be first class, as it had been kept in a cool cellar and the tubers were firm and showed little sprouting when the potatoes were planted, yet the results were very poor.

A table of the yields of the four varieties already referred to for the years 1906-1909 is interesting:—

Year.	Early Rose.	State of Maine.	Empire State.	Delaware.
	Yield Per acre.	Yield Per acre.	Yield Per acre.	Yield Per acre.
	Bush.	Bush.	Bush.	Bush.
1906	150	132	132	103
1907	128	174	117	114
1908	69	97	117	156
1909	18	62	62	53
Average 1906-09	91	116	132	131
Average, 1902-1906, before the drought	317	361	338	352

It will be seen from the above figures that there has been a marked falling off in yield during the past four years, part of which in the years 1907 and 1908 was doubtless due to the weakened vitality of the seed and part to the very unfavourable seasons. In 1909, with a more favourable season and good cultivation, the small yield is evidently owing largely to seed low in vitality, although, in 1909, there was considerable injury from disease which caused the rotting of the stem. Newer seed of other varieties yielded in these bad years as high as at the rate of 224 bushels per acre in 1906, 462 bushels per acre in 1907, 325 bushels per acre in 1908 and 321 bushels per acre in 1909, showing that, notwithstanding unfavourable conditions, seed of strong vitality gave good results.

As the crop of potatoes had been so poor in 1906, and as the prospects for a good crop in 1907 from seed of the previous year's crop were not thought favourable, it was considered desirable to compare the results with imported seed. Accordingly, small quantities of tubers of six well-known varieties of potatoes were procured from the Experimental Farm, Nappan, N.S. As the best of the home-grown seed had been used in other experiments before this imported seed was planted, the results obtained that year are not considered reliable, but it may be said that the average yield from the imported varieties was almost twice as great as from the home-grown seed of the same sorts. In 1908, it was possible to make a fairer comparison, and the best seed from the imported stock of the year before was compared with the best seed of the home-grown stock. The results were published in the annual report for 1908, and showed an average increase from the six varieties of 133 bushels per acre in favour of the Nappan seed.

This test was continued in 1909, new seed of some of the same varieties being obtained from Nappan again this year and compared with the Nappan stock of 1907 grown two years at Ottawa and with our old stock. The results are as follows:—

—	Rochester Rose.		Carman No. 1.		Vick's Extra Early.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Nappan seed, 1909	215	36	198	0	171	36
Nappan seed, 1907	127	36	52	48	198	0
C. E. F. seed	41	0	83	36	74	48

It will be seen from this table that, in every case, the Nappan seed of 1909 yielded much more than the Experimental Farm seed—nearly five times as much in one case and more than twice as much in two cases. In two cases the Nappan seed of 1907 yielded much better than the Farm seed of the old stock, although in one case the Farm seed did a little better.

These results show that a change of seed sometimes more than doubles the yield of potatoes. How, then, shall we decide when it is desirable to have a change of seed and what are the conditions which give seed strong vitality?

If we know when to change our seed and where to get it from, there is no doubt but that potato growing would be much more profitable.

In the first place, every potato grower should be an experimenter. He should try on a small scale the varieties which other experimenters have found most productive. If he discovers a variety which is better than his own, he should not only grow more of that variety, but when he is getting the seed he should, if possible, get it from the same source as he obtained his trial lot from, for if he obtained it from another source it might not do as well as his own.

If a grower has been getting but fair or poor crops from the variety he is growing, he should try a change of seed, even if getting the same variety. Moreover, when he has found that it pays him to obtain seed of a certain variety from a certain source, he should endeavour by experiment and calculation to learn whether it will pay him to change his seed every year, every two years or every three years.

It has been fairly well shown, we think, that potatoes which are prematurely ripened, either by an early drying-up of the tops or by poor development on a weak vine, are low in vitality and should not be used as seed if the best results are desired. In Great Britain it is now well recognized from the results of careful experiments that seed potatoes from the south of England, where the climate is comparatively dry and warm, and where potatoes ripen much more rapidly than they do in Scotland and Ireland, do not give nearly as large yields as seed potatoes from Scotland and Ireland. In an experiment which I had the opportunity of seeing at Sutton & Sons, Reading, England, in 1905, where Scotch and English seed of the same varieties had been planted side by side, the English stock was evidently three weeks nearer maturity than the Scotch stocks.

In an experiment conducted in England by the Department of Agriculture of Ireland to determine the relative value of Irish and English seed potatoes there was a marked difference in favour of the Irish seed.

It is now fairly well proven that the cause of the seed potatoes being better from Scotland and Ireland than from some parts of England is that the tubers in the former countries are not hurried to maturity by hot, dry weather, and on this account have more vitality or power to make strong growth when planted than where the summers are comparatively hot and dry. Coming nearer home, the conditions in the drier and warmer parts of Ontario may be compared with England, while the conditions in the moister and cooler parts of Ontario and the maritime provinces may be compared with Scotland and Ireland. It is possible that as marked results could be obtained from a change of seed from the cooler parts of Quebec and Northern Ontario as from Nappan, Nova Scotia. It may even be that seed potatoes from a cool, moist clay loam soil near home might show some striking results.

There is a difference between immature tubers and prematurely ripened tubers. Potatoes grown in cool climates tend to be immature. Potatoes grown in warmer climates tend to be prematurely ripened. Immature potatoes may be growing vigorously and the tops be cut off by the frost, or they may be dug before the tops are dead and before they are perfectly ripe. The tubers are checked in growth but are full of vitality. It is interesting to note that immature potatoes have been recommended for seed potatoes in England for at least one hundred years.

The Department of Agriculture for Ireland makes this recommendation:—

'Immature seed.—It is now recognized that seed from crops lifted before they are fully mature will produce more vigorous plants, and, consequently, heavier yields than seed from crops which have been allowed to become fully ripe. In Ireland this applies more particularly, perhaps, to early varieties, but it is a point worthy of notice by growers of seed potatoes.'

At the Central Experimental Farm the seed from tubers grown from potatoes planted on June 23, and even on July 7, 1899, yielded, in 1900, more than those from potatoes planted May 22, 1899. The late planted ones were not so mature or were immature when dug.

SPRAYING.

For the past nineteen years experiments in spraying have been conducted by the Horticultural Division every season, and useful information has been obtained as to the value of different spraying materials for the prevention of fungous diseases and insect pests. Much work has been done by experimenters during the past few years with the lime-sulphur washes, especially in those districts where the San José scale is troublesome, but at Ottawa, where there is no San José scale, the experiments have been mainly in other directions. The lime-sulphur wash has been found to be the best spray so far known for winter use to control this scale insect, and it is now being used in a more dilute condition as a summer spray as well, but so far it has not been shown what strength may be safely used in all parts of Canada. Just as a certain strength of Bordeaux mixture causes russeting of apples in some parts of Canada while in others it does not, so will a certain strength of lime-sulphur cause injury in one place while in another it will not. Much seems to depend on the relative wetness or dryness of the season, or the relative moistness or dryness of the air. In Nova Scotia, for instance, where the air is moister than it is in some parts of Ontario and Quebec injury from spraying materials is more likely to occur than in the latter provinces, the leaves, on account of the moistness, being less able to resist the fungicides or insecticides; hence a formula for a summer spray is not always the best for all parts of the Dominion. When it is desired to make the lime-sulphur wash at home for winter use, a good formula is 20 lbs. of lime, 15 lbs. of sulphur and 40 gallons of water, boiled for an hour. Some of the larger growers now prefer tc make the mixture in a more concentrated condition. The proportions found best foı the concentrated mixture by Prof. Stewart, of the Pennsylvania Experiment Station who has made a special study of the subject and who uses a larger proportion of sulphur, are 100 lbs. lime, 200 lbs. sulphur, 80 gallons of water (100 gallons wine measure). When boiled down there should be about 80 imperial gallons of the concentrated material, sufficient water being added to make this amount. The degree to which this will be diluted after it is made will depend on its density. There are a a number of commercial concentrated lime-sulphur washes now on the market, and as the best of these have given about as good results, on the whole, as material made at home, they are fast becoming the more popular. A dilution recommended for winter use is 1 gallon of the concentrated wash in 9 gallons of water, but the density of the commercial washes varies as does that of the home-made washes, hence it is well to use a hydrometer to determine the density and base the dilution on that. For summer use, lime-sulphur in the proportion of 1 gallon of the concentrated wash in 29 gallons of water has been successfully used, but, as stated before, this strength may cause injury in some parts of the country and in some seasons, and further trials are necessary to determine the most effective strength which can be used at the least risk. Arsenate of lead has so far been found to be the best poison to use with the lime-sulphur wash.

At Ottawa, Bordeaux mixture continues to give very satisfactory results in the control of apple spot and where russeting does not occur is to be preferred to the lime-sulphur mixture for the prevention of this disease. Arsenate of lead with

Bordeaux has given excellent results in the control of Codling Moth, although Paris green has been found quite effective also.

EXPERIMENTS IN 1909.

LIME-SULPHUR FOR APHIS EGGS.

An experiment was conducted in the spring of 1909 to determine what effect the lime-sulphur wash had on the eggs of the Apple Aphis. Three rows of young nursery trees, each 85 feet long and badly infested with eggs, were sprayed on May 8 with the Niagara brand of lime-sulphur diluted in the proportion of 1 gallon to 11 gallons water. Other rows were left unsprayed for comparison. As far as could be determined, the lime-sulphur did not destroy any of the eggs; the insects appeared to be as abundant after they were hatched on the sprayed as on the unsprayed trees.

LIME-SULPHUR FOR GOOSEBERRY MILDEW.

Both in 1908 and 1909 the Niagara brand lime-sulphur has been used in the proportion of 1 part of the wash to 11 parts of water for the control of gooseberry mildew, but only one spraying has been given each year, namely, when the buds were breaking. The spray was applied in 1909 on May 8 to twenty-six varieties of gooseberries, one bush of each of these varieties being left unsprayed. Notes were taken on July 28 and in no case was there a noticeable difference in the amount of mildew in favour of the sprayed bushes. Similar results were obtained in 1908. It is possible that, with the addition of several summer sprays, the disease may be controlled with the lime-sulphur wash and it is hoped to continue experiments in this direction.

INSECTICIDES TO CONTROL APPLE APHIS.

The apple aphis has been very troublesome some years in the orchards at the Central Experimental Farm and was especially so during the past two years. Experiments have been tried with a number of insecticides for the control of aphis, and the results have been published from time to time in the annual reports, the last result appearing in the report for the year ending March 31, 1909. In the summer of 1909, some of the insecticides tried the previous year were used again for comparison with others, and the results are given below. The cost of the material makes some of the insecticides decidedly the most economical to use. In this respect, the whale oil soap is much the best when large quantities are required, as it was obtained by the barrel in 1909 for 3 cents a pound.

Spraying large trees for aphis is, at the best, an unsatisfactory business; one spraying is not sufficient. The insects multiply so rapidly, and it is so difficult to hit them, that it is necessary to give a second and even a third spray at intervals of a week or less to keep the insects under control, and sometimes this is not practicable.

One row each of apple trees in nursery rows, each 90 feet long, was sprayed with each of the insecticides given in the following table. The trees were sprayed on July 14 and July 20. Notes were taken of the results on July 15 and July 22, 1909. The trees in all the rows were badly infested with aphis before spraying.

NURSERY STOCK—APPLE TREES.

SPRAYED WITH INSECTICIDES FOR THE CONTROL OF APHIS, 1909.

Plot 1.—Campbell's Nico Soap, 1 lb. to 40 gallons water:—

First spraying, how infested July 15, after spraying: a large proportion killed, but many still left, of which a considerable number are on trunk. Second spraying, July 20; after spraying, July 22; aphis nearly all dead, a very few left on some upper leaves. Cost per barrel of 40 gallons, 50c.

Plot 2—V-2 Fluid, 3½ pints to 40 gallons water.

First spraying, July 15; after spraying: a fairly large proportion killed, but many left; more than in Plot 1. Second spraying, July 20; after spraying, July 22;

a few aphis on trunk and considerable number on upper leaves. Cost per barrel of 40 gallons, $1.

Plot 3—McDougall's Insecticide, 3½ pints to 40 gallons of water:—

First spraying, July 15; after spraying: more killed than in either Plot 1 or Plot 2. Second spraying, July 20; after spraying, July 22; practically all dead on trunk; a considerable number left on upper leaves. Cost per barrel of 40 gallons, 72c.

Plot 4—Whale oil soap, 7 lbs. to 40 gallons of water:—

First spraying, July 15; after spraying: a large proportion killed, but few still left on trunk and many on under side of leaves; if anything, a little more effective than sprays 1 and 2. Second spraying, July 20; after spraying, July 22; practically all dead on trunk; a considerable number left on upper leaves. Cost per barrel of 40 gallons, 23½c.

Plot 5—Kerosene emulsion, 4½ gallons oil, 5 lbs. flour, 36 gallons water:—

First spraying, July 15; after spraying: a large proportion killed, but a few still left on trunk and many on under side of leaves. About like Plots 1 and 2. Second spraying, July 20; after spraying, July 22; practically all dead on trunk, a few left on upper leaves. Cost per barrel of 40 gallons, 72c.

Plot 6—Kerosene emulsion, 3 gallons of oil, 12 ounces of Takanap soap, 40 gallons of water:—

First spraying, July 15; after spraying: a large proportion killed, but a few still left on trunk and many on under side of leaves; about like Plots 1 and 2. Second spraying, July 20; after spraying, July 22: a few aphis on trunk, a considerable number on upper leaves, much as Plots 2, 3 and 4. Cost per barrel of 40 gallons, 47½c.

INSECTICIDES TRIED FOR CONTROLLING THE COLORADO POTATO BEETLE.

Every year the farmer and horticulturist who grows potatoes has to fight and conquer the Colorado Potato Beetle if he is to obtain a good crop of potatoes. Paris green has been the insecticide most generally used for the past twenty-five or thirty years, and most effectually will it destroy the young beetles as long as it remains on the foliage. The young beetles eat so rapidly, however, and there are usually so many of them, that unless the poison is well distributed over the leaves, many of the latter will be eaten before the larvæ are killed. For this reason, much more Paris green is often used per barrel of water than is necessary if it were put on with a fine spray and covered the leaves well. Farmers will use as much as two pounds of Paris green to 40 gallons of water, whereas half a pound to that quantity of water has given excellent results at the Experimental Farm in fine weather. Some times the weather is showery, and, at such times, larger quantities are necessary in order that the bugs may be destroyed quickly. Of late years, arsenate of lead has been taking the place of Paris green as an insecticide for fruit trees and is now being used more extensively for potatoes. Arsenate of lead does not injure the foilage as does Paris green at times, and, on account of the particles being more finely divided, it stays in suspension longer and adheres better. It does not kill quite so rapidly as Paris green, but it is surer to kill in showery weather because it stays on the leaves when much of the Paris green is washed off. A larger quantity of it has to be used per barrel than Paris green, but as it is about half the cost of the latter, the expense is almost the same.

The following experiments were tried mainly for the purpose of comparing Paris green with arsenate of lead and to show what quantity of arsenate of lead was the most economical to use. Paris green and arsenate of lead were also tried mixed, in order to have the quick action of the Paris green and the adhesiveness of the arsenate of lead in the same mixture. Arsenite of lime and arsenite of soda were also used. These insecticides were sprayed on rows, each fifty feet in length, in some cases several rows being sprayed with one insecticide. In the second experiment the rows were sixty-six feet in length.

TEST OF INSECTICIDES FOR CONTROLLING THE COLORADO POTATO BEETLE.

Number of Plot.	Experiment No. 1. — Insecticide Used.	1st Spray. Number of young beetles.—July 9. Before spraying.	1st Spray. Number of young beetles. — July 12.	Extra Spray for some plots. Number of young beetles.—July 13. Before spraying.	1st Spray and extra spray. Number of young beetles. — July 16.	2nd Spray. Number of young beetles.—July 24. Before spraying.	2nd Spray. Number of young beetles. — July 26.
1	8 ozs. Paris green to 40 gals. water	Few	Fairly numerous	Fairly numerous	Few	Fairly numerous	Very few.
2	3 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	"	None		"	Few	"
3	8 ozs. Paris green and 1½ lbs. Arsenate of Lead (Vreeland) to 40 gals. water	"	"		"	Numerous	"
4	8 ozs. Paris green and 3 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	"	"		"	Few	None.
5	1 lb. Paris green to 40 gals. water	Fairly numerous	"		"	Fairly numerous	"
6	2 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	"	"		"	"	"
7	Arsenite of Lime (Arsenite of Soda, Solution 1 pint) Lime 2 lbs., water 40 gallons	"	Few	Few	"	Numerous	Few.
8	Arsenite of Lime (Arsenite of Soda, Solution 1 quart) Lime 2 lbs., water 40 gallons	"	Very few	Very few	Very few	Fairly numerous	"
9	Arsenite of Lime (White Arsenic, 2 ozs., Lime 2 lbs., water 40 gallons)	Numerous	Fairly numerous	Fairly numerous	Few	Numerous	"
10	Arsenite of Lime (White Arsenic 4 ozs., Lime 2 lbs., water 40 gallons)	"	"	"	None	Few	None.
	Check Plots.						
11	8 ozs. Paris green to 40 gals. water	"	"	"	Very few	Fairly numerous	Very few.
12	3 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	Fairly numerous	None		None	Very few.	None.
13	8 ozs. Paris green and 1½ lbs. Arsenate of Lead (Vreeland) to 40 gallons water	"	"		"	"	"
14	8 ozs. Paris green and 3 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	Few	"		"	"	"
15	1 lb. Paris green to 40 gals. water	Fairly numerous	"		Very few	Fairly numerous	"
16	2 lbs. Arsenate of Lead (Vreeland) to 40 gals. water	Few	"		Few	"	"

Number of Plot.	Experiment No. 2. — Insecticide Used.	Number of Young Beetles. — Aug. 12 Before Spraying.	Number of Young Beetles. — Aug. 14.	Number of Young Beetles. — Aug. 25.
1	1 lb. Arsenate of Lead (Vanco) to 40 gall. water	Fairly numerous..	Few........	Fairly numerous.
2	1½ do do do ..	Fairly numerous..	Few.	Fairly numerous.
3	2 do do do ..	Fairly numerous..	Few........... ..	Few.
4	2½ do do do ..	Fairly numerous..	Few............ ...	Very few.
5	3 do do do ..	Fairly numerous..	None...........	None.
6	8 ozs. Paris green to 40 gallons water......	Fairly numerous..	Few	Fairly numerous.
7	1 lb. do do do ..	Fairly numerous..	None...	Very few.
8	Arsenite of Lime (Arsenite of Soda Solution 1 pint Bordeaux mixture 40 gallons).. ...	Fairly numerous..	Fairly numerous...	Fairly numerous.
9	Arsenite of Lime (Arsenite of Soda Solution 1 quart Bordeaux mixture 40 gallons)......	Fairly numerous..	Few.............	Fairly numerous.
10	Arsenite of Lime (2 ozs. White Arsenic to 40 gallons Bordeaux mixture)........	Fairly numerous..	Few.............	Fairly numerous.
11	Arsenite of Lime (4 ozs. White Arsenic to 40 gallons Bordeaux mixture)......	Fairly numerous..	Few...	Fairly numerous.
12	Arsenite of Lime (4 ozs. White Arsenic, Lime 2lbs., to 40 gallons water... . ..	Fairly numerous..	None....	Fairly numerous

In the first experiment it was found necessary to make three applications of the spraying material on Plots 1, 7, 8, 9, 10, 11, while two were sufficient for the others. It will be seen that 8 ounces of Paris green to 40 gallons of water did not prove so effective as 1 lb. of Paris green to 40 gallons of water, the latter quantity giving quite satisfactory results. It may be observed here that, in other years, 8 ozs. of Paris green to 40 gallons of Bordeaux mixture, and even to 40 gallons of water, has given satisfactory results when the weather remained fine for some time after spraying. Three pounds of arsenate of lead to 40 gallons was more effective than 1 lb. of Paris green; and 2 lbs. arsenate of lead to 40 gallons water was as effective as 1 lb. of Paris green. The formula of 8 ozs. Paris green, 1½ lbs. arsenate of lead to 40 gallons water gave as good results as any. The arsenite of lime formulas were effective, particularly those used on Plots 8 and 10, but three applications were necessary in order to control the larvæ.

In the second experiment, where a different brand of arsenate of lead was used and other formulas tried, it was found that 2 lbs. of arsenate of lead to 40 gallons of water was quite effective, though slightly better results were obtained with larger quantities. It will be seen that the results from the arsenite of lime formulas were not as satisfactory as those where 1 lb. Paris green or 2 lbs. or more of arsenate of lead were used.

From the experiments tried in 1909, it would appear that the best formulas are arsenate of lead, 2 to 3 lbs. to 40 gallons of water; Paris green, 1 lb. to 40 gallons water; and Paris green 8 ounces, arsenate of lead 1½ lbs. to 40 gallons water. It is thought that Paris green and arsenate of lead applied together will give better results on the whole than the two applied separately. The Paris green appears to kill quicker than the arsenate of lead, but the latter is much more adhesive. To get the best results, both Paris green and arsenate of lead should be made into a thin paste by adding a little water to the poisons and stirring before diluting to the formula recommended. The formulas found best when used without Bordeaux mixture might need altering in the direction of using less poison, as has been found to be the case with Paris green.

Arsenate of lead costs a little more than half as much as Paris green, and white arsenic is about half the cost of Paris green per pound.

ARBORETUM AND BOTANIC GARDEN.

The collection of trees, shrubs and herbaceous plants in the Arboretum and Botanic Garden is now one of the largest in America. It has been brought to its present size by a gradual but regular increase in the collection from year to year. By being constantly on the look out for new things from other institutions, nurserymen and private individuals it has been possible to add a considerable number of species and varieties every year. Many species are grown from seed and later are transplanted from the nursery to their permanent positions. The number of species and varieties of trees and shrubs added in 1909 was 129, making a total of 3,204 species and varieties, represented by 4,929 specimens living in the Arboretum in the autumn of 1909. The number of species and varieties of herbaceous perennials added in 1909 was 178. The total number living in the autumn of 1909 was 2,044. There was an average amount of injury to trees, shrubs and herbaceous plants from the winter of 1908-09. The summer of 1909 was a favourable one for growth and most of the plants did well.

From time to time lists have been published of the best trees, shrubs and herbaceous plants, which have been found very useful by those who desire to improve their grounds.

Following is a list of the best *Philadelphus* tested in the Arboretum, with notes upon them:—

THE BEST PHILADELPHUS.

The genus *Philadelphus,* to which the names Mock Orange and Syringa are commonly applied, has among its species and varieties some of the most desirable hardy ornamental shrubs. Blooming after the bush honeysuckles, lilacs, early spiræas and viburnums are over, these shrubs do much to enliven the landscape by their charming, white flowers, which are borne in great profusion. The lower-growing varieties, which are found chiefly among the Lemoine hybrids, are especially valuable where deutzias are tender. A good collection of philadelphus will furnish bloom from four to five weeks, the earliest varieties blooming in early June at Ottawa, while the latest are not out of bloom until near the middle of July and sometimes not until after the middle of that month.

In the Arboretum and Botanic Garden at the Central Experimental Farm, there are 61 species and varieties of *Philadelphus.* Some of these are, however so much alike that for ornamental purposes they may be considered the same. The nomenclature of the *Philadelphus* is so confusing owing to hybridization that, in the following list of the best species and varieties tested at Ottawa, their trade names are used:

Philadelphus Schrenkii (Mandschuria).—Height, 5 feet; flowers medium size, white, from 4 to 5 on each raceme; very sweet scented. A free bloomer and desirable on account of its extreme earliness—being about a week earlier than *P. coronarius.* Not specially showy.

Philadelphus coronarius (Southeastern Europe; Caucasus).—Height, 8 to 10 feet; flowers medium size, creamy-white, from 5 to 6 on each raceme, very sweet scented. A free bloomer. The typical Mock Orange, and popular because of its being sweet scented. Season early. A variety, *P. coronarius semi-plenus,* is better than the type. It has 6 to 9 flowers to the raceme and some of the flowers have a few extra petals.

Philadelphus grandiflorus laxus.—Height 10 feet; flowers large to very large, averaging 2 inches in diameter, pure white in loose racemes of from 3 to 6 flowers;

sweet scented. Season early. A free bloomer and evidently of hybrid origin. The best early variety at the Experimental Farm.

Philadelphus speciosissimus.—Height, 9 feet; flowers above medium size, averaging 1½ inches in diameter, creamy-white, in racemes of 3 to 5 flowers; sweet scented. A very free bloomer; season early. Begins to bloom about 2 days after *P. grandiflorus laxus.*

Philadelphus Lemoinei.—Under the specific name of Philadelphus Lemoinei a great many attractive varieties have been sent out by the firm of V. Lemoine & Son, Nancy, France. Most of those which have been introduced are hybrids between *P. microphyllus* and *P. coronarius.* The former variety is not altogether hardy at Ottawa and some of the hybrids have proven too tender also, among these being Avalanche, Boule d'Argent, Candelabre, Gerbe de Neige and Pavillon Blanc, but the following varieties have done well:—

Philadelphus Lemoinei Boquet Blanc.—Height, 6 feet; flowers below medium size, 1 to 1¼ inches in diameter, creamy-white, sometimes with additional petals, sweet scented, in compact racemes, averaging 7 to 8 flowers, but often 15 to 20 flowers, so arranged that they almost touch one another, giving the bush the appearance of being almost covered with bloom; season medium. The best low growing variety and appears hardier than most of the Lemoine hybrids. Older specimens may grow taller.

Philadelphus Lemoinei Nuee Blanche.—Height, 5 feet; flowers large, 1¾ inches in diameter, pure white, slightly scented, in racemes of 3 to 5 flowers, mostly 3; season medium. *P. Lemoinei Rosace* is somewhat similar, but some flowers are semi-double. Older specimens may grow taller.

Philadelphus Lemoinei Mont Blanc.—Height, 4 feet; flowers small, ⅞ to 1 inch in diameter, white, sweet scented, in slender racemes of 5 flowers; midseason; very free bloomer. Valuable because so low growing.

Philadelphus Lemoinei Manteau d'Hermine.—Height, 3 feet; flowers small creamy-white, semi-double, sweet scented, in racemes of 5 to 8 flowers; midseason. A very free bloomer and valuable because so low growing.

Philadelphus grandiflorus major.—Height, 7½ feet, but will probably grow taller; flowers very large, 2 to 2¼ inches in diameter, pure white, almost scentless, in racemes of 3 to 5 flowers, mostly 3; midseason. A very distinct and attractive variety.

Philadelphus 144 Voronesh.—Brought from Russia by the late Prof. J. L. Budd. Height, 10 feet; flowers very large, averaging 2 inches in diameter, pure white, almost scentless, in racemes of 3 to 5 flowers; season medium late. Very free bloomer. The best of its season.

Philadelphus grandiflorus (Virginia to Florida).—Height, 14 feet; flowers large, 1⅝ inches in diameter, white, sweet scented, in racemes of 8 to 11 flowers; season late. A free bloomer. Others which resemble this very much are *P. latifolius, P. latifolius sanguineus* and *P. latifolius verrucosus*, and *P. pubescens.* While there are others of the same season of more graceful habit, this is valuable because of its great height.

Philadelphus Gordonianus gracilis.—Height, 10 feet; flowers large, 1½ to 1¾ inches in diameter, white, sweet scented, in racemes of 5 to 7 flowers; season late. A free bloomer and of graceful habit. A very good variety.

Philadelphus inodorus speciosus grandiflorus.—Height, 9 feet; flowers medium size, 1⅜ to 1½ inches in diameter, white, almost scentless, in close racemes of 5 to 7

flowers; season late. A free bloomer, graceful, and with rather small foliage. One of the best of its season.

Philadelphus columbianus floribundus.—Height, 6 feet; flowers medium size, $1\frac{1}{4}$ to $1\frac{3}{8}$ inches in diameter, white, sweet scented, in long racemes of 9 to 10 flowers, usually in pairs; season late. A very free bloomer.

Philadelphus Gordonianus monstrosus.—Height, 8 feet; flowers medium size, $1\frac{3}{8}$ to $1\frac{1}{2}$ inches in diameter, creamy-white, sweet scented, in racemes of 7 to 8 flowers; season late. A very free bloomer.

Philadelphus coronarius myrtifolius.—Height, 9 feet; flowers medium size, $1\frac{3}{8}$ to $1\frac{1}{2}$ inches in diameter, pure white, sweet scented, in compact racemes of 7 to 9 flowers; season late. A free bloomer and a graceful and distinct variety.

Philadelphus Billardii (P. pubescens Souvenir de Billard)—Height, 8 feet; flowers above medium size, $1\frac{1}{2}$ inches, pure white, almost scentless, in racemes of 15 to 20 flowers, the latter usually in threes; season very late. Very desirable on account of lateness and attractive appearance. Is injured by winter in some years

REPORT OF THE CEREALIST

CHARLES E. SAUNDERS, B.A., PH.D.

OTTAWA, March 31, 1910

DR. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the seventh annual report of the Cereal Division.

The season of 1909 was not so unfavourable for cereals at Ottawa as might have been expected from the unusually cool and wet weather in spring. A very favourable summer brought the crops up to a fair average in many instances.

The propagation of some of the new, selected, cross-bred varieties of cereals which have originated from the cross-fertilizing done in the year 1903 (just after the establishment of this Division as a separate branch of the work) has now progressed so far that a large series of small plots was sown last spring, many of which yielded several pounds of seed. About fifty of the new sorts of wheat from these small plots were submitted to milling and baking tests during this winter, with most interesting results, some of them surpassing Red Fife wheat in their ability to produce light bread.

The regular milling and baking researches conducted in this Division included also such problems as the effect of storage on wheat and flour, damp wheat, bleached flour, &c., besides the testing of new varieties and of older sorts grown in various sections of the Dominion.

Mr. Geo. J. Fixter, the foreman of the field work of this Division, has carried on his work in his usual faithful and competent manner. I am indebted to him for keeping the records of all the regular test plots as well as for valuable assistance in other ways.

In the following pages there are presented some of the most interesting results of the work done between April 1, 1909, and March 31, 1910.

I have the honour to be, sir,

Your obedient servant,

CHARLES E. SAUNDERS,

Cerealist.

MEETINGS ATTENDED.

The most important meetings attended during the year were those of the British Association for the Advancement of Science, held at Winnipeg towards the end of August.

At a joint session of the sections dealing with Agriculture and Chemistry, many papers on wheat were presented, including one by the writer on 'Wheat Breeding in Canada.' As this paper is being published in England in a somewhat inaccurate and condensed form, it has been thought best to print it here in full.

"WHEAT BREEDING IN CANADA."*

On account of the vast extent and the varied climatic conditions of Canada, it seems necessary at the beginning of this paper (in order that we may intelligently consider our subject) to mention briefly the chief sections into which the country may be divided on the basis of its wheat production. Viewed in a broad way, we may recognize six distinct wheat-growing areas.

I. The Maritime Provinces: Nova Scotia, Prince Edward Island and New Brunswick.—In these large tracts of country not very much wheat is grown. Most of the grain is sown in the spring and the yields obtained are usually good, the kernels being plump, but rather soft and starchy.

II. Quebec and Northern Ontario.—In this large area, spring wheat, rather than winter wheat, is usually grown, although the total quantity produced is not very great considering the numerical strength of the farming population. The kernels of the spring wheat produced in this section of Canada are usually somewhat smaller and harder than those grown in the maritime provinces. When the varieties which yield the strongest flour are sown, the wheat from this area is scarcely surpassed in flour strength by that grown in any other part of Canada, though in appearance it is usually less attractive than the grain from the western prairies.

III. Southern Ontario.—The mild winter and the rather hot and dry summer make the conditions in this region more favourable to winter wheat than to spring wheat. Most of the sowing is, therefore, done in the autumn, September and October being the favourite months. The winter wheat of Southern Ontario is typically large, plump and quite starchy. When spring wheat is sown, a variety of durum wheat known in Canada as 'Goose' or 'Wild Goose' is often used because it gives a better yield than the ordinary varieties used for bread making. Goose wheat is used chiefly for feeding purposes or for the manufacture of macaroni.

IV. Manitoba, Saskatchewan and the northern and central parts of Alberta.—This enormous tract of country is devoted very largely to the cultivation of spring wheat which, as a rule, gives a good yield and produces kernels of a hard, glutinous character scarcely to be surpassed. Winter wheat has been tried in some sections, but has not proved uniformly successful.

V. Southern Alberta.—Winter wheat has been profitably grown for many years in the southwestern portion of Alberta and the cultivation of this crop has been largely increased of late, the area devoted to it being extended northwards and eastwards. Spring wheat is also grown in this portion of the province, but to a smaller extent than winter wheat. The yield per acre of winter wheat is usually large and the kernels are exceptionally heavy and hard.

* Read before the British Association for the Advancement of Science, at Winnipeg August, 1909.

Experimental Plots, Central Experimental Farm, Ottawa. Peas and small plots of cereals in the foreground. Sixtieth acre plots of wheat in the distance.
Photograph taken in the month of May, 1910, by C. E. Saunders.

VI. British Columbia.—This province does not produce very much wheat though it is grown in some localities and found profitable. Both winter and spring varieties are sown. The diversity of climates in this province is so great as to render impossible any general descriptive remarks on the subject.

From the details just given it will be readily seen that winter wheat occupies in Canada a distinctly subordinate place to that of spring wheat. In order, therefore, to bring my subject within reasonable limits, I shall take the liberty of omitting all discussion of the work which has been done in this country in regard to winter wheat. In regard to spring wheat almost all the systematic and careful work which has been done in Canada has been carried on at the Dominion Experimental Farms during the past twenty-two years, and it is in regard to this work that I shall address you.

Most of the breeding and selecting of varieties of wheat in connection with the Dominion Experimental Farm system has been performed at the Central Farm at Ottawa where the climate resembles, in many respects, that of most of the spring wheat districts of Canada. It might appear, on first thought, as if better results would have been obtained by conducting the work independently at each of the Experimental Farms, but not only would this plan have involved an expenditure of money several times in excess of that required under the existing arrangement, but it would have introduced greater risks as well; for it must be remembered that when such operations are carried on under trying conditions of climate, any season of exceptional severity might seriously cripple the work just when results of value were being looked for. The present arrangement under which the cross-breeding and the fixing of types are carried on at Ottawa is therefore clearly the most desirable. Of course, the selections made at the Ottawa Farm are only provisional, the most promising varieties being afterwards sent to the various Branch Farms for further trial and for the rejection of any of them which are found to be unsuited to the local conditions.

When the Dominion Experimental Farms were first established, the settlement of the great prairie country of central and western Canada had not progressed very far, and there were various problems of vital importance connected with the growing of wheat on the plains which awaited investigation. Hence it was natural that special attention should be paid to these new sections of country. While, therefore, the needs of the older farming districts have not been overlooked, and results of value to them have been reached along various lines of research, the most interesting branches of our work have been those concerning the great wheat-growing plains. The short summer of the prairies emphasized the need for early maturing varieties of wheat, while the long distance between the farmer and the main centres of wheat consumption made it essential that only such varieties should be grown as would command an exceptionally high price in the world's markets, so that the cost of transporting the grain would be relatively low.

The prairie settlers found the famous Red Fife wheat very satisfactory on the whole, except in regard to the time taken to mature the crop, which, in the less favourable seasons, was rather too long; so that the fields were sometimes touched with frost before the grain was ready to be cut, thus very seriously lessening the farmers' income. In hardness of kernel and in flour strength (the characteristics which perhaps chiefly determine the selling price of any wheat) this variety ranks at the head of its class. What was needed, therefore, for the great wheat-growing plains was an early Red Fife, a variety having all the good qualities of ordinary Red Fife with the added excellence of earliness.

To meet this need, early ripening varieties of wheat were imported from various countries by the Director of the Experimental Farms and, at as early a date as possible, experiments in cross-breeding were begun for the purpose of combining in one sort all the desired qualities. Naturally, Red Fife was used as one of the parents in the majority of the crosses which were effected, for, from a commercial point of view, this wheat possesses perhaps more good qualities than any other well-known kind.

None of the early wheats imported from other countries proved satisfactory for our conditions, although some of them have been found of great value in cross-breeding. The new and improved varieties which have been or are being given to the public have, therefore, been produced either by cross-breeding (followed by selection) or by the mere selection of superior strains out of existing sorts. Both of these lines of work have given valuable results, though selection alone, however satisfactory it may be in a theoretical way, has been found to be quite limited in its practical possibilities.

The work of cross-breeding was begun by Dr. Wm. Saunders (the Director of the Experimental Farms) and his assistants in the year 1888. The principal crosses which were made at that time were between Red Fife wheat (or White Fife, which is an almost identical sort) and an early-ripening variety which had been obtained from Russia. Some years later other crosses were effected, but the main interest has thus far been centred in the progeny of the first crosses, especially the varieties known as Stanley, Preston and Huron, which are now widely distributed throughout the western provinces and which have contributed largely to successful wheat growing in many of the less favoured localities during the past few years.

In the earlier years of this wheat-breeding, when the principles of heredity were not so well understood as they are at present, the system of selection after crossing was not so thorough as that now known to be necessary. The cross-bred varieties first introduced were, therefore, not quite fixed in some essential respects, and it devolved on the writer of this paper, who was appointed in the year 1903 to take charge of the work with cereals, to reselect all the varieties of wheat obtained from the crosses effected up to that time. By this reselection, on Mendelian lines of course, the early cross-bred wheats have been distinctly improved, and the best of the new, selected strains combined to a very large extent the good qualities of both parents. Stanley, Preston and Huron, as now grown at the Experimental Farms, are vigorous, early sorts, ripening a few days—or sometimes nearly two weeks—before Red Fife, and having hard, bright kernels of the popular reddish-brown shade. In yield of grain per acre they often surpass Red Fife, even when the conditions are favourable to the latter sort, and in yield of flour in the mill they are quite satisfactory. In one respect, however, they are all somewhat inferior to Red Fife, from a commercial point of view: for while they produce flour of good quality it does not usually possess the remarkable baking strength which generally characterizes Red Fife flour. Preston and Huron have a further, but not very serious, disadvantage of yielding flour of a deeper yellowish colour than that made from Red Fife. Stanley gives flour of the same shade as Red Fife.

In addition to the three new varieties just mentioned, which inherited their early-maturing qualities from a wheat from Northern Russia, reference should be made to three other cross-bred sorts, the value of which has recently been demonstrated. These are Marquis, Chelsea and Bishop, varieties which owe their earliness largely to the fact that one of the parents in each case was a very early wheat obtained from India. Marquis and Chelsea are descended in part from Red Fife. Bishop is an Indo-Russian cross. Of these newer varieties, Marquis is perhaps the most important, showing distinct superiority over the cross-bred varieties first introduced in regard to the character of the flour produced from it, which both in strength and in colour is practically identical with Red Fife. Comparative baking tests carried on last winter with samples from the crop of 1908 showed that Marquis grown at Brandon, Manitoba, was equal in colour and strength of flour to Red Fife grown on the same farm and was superior to Red Fife grown at Indian Head, Saskatchewan. The differences observed were not very great and might perhaps be reversed another season, but the high strength of Marquis is fully established by these and previous tests. Marquis is a beardless wheat, having hard, red kernels and resembling Red Fife in all respects, except that it is earlier in ripening. It ripens about with Stanley, Preston and Huron.

Philadelphus Lemoinei Bouquet Blanc.

Chelsea is a very early, beardless wheat which has been found satisfactory in all respects except flour strength, in regard to which it ranks about with Stanley and Preston. It closely resembles the new, selected strain of Stanley, but seems to be earlier and perhaps more productive than that variety.

Bishop is a still earlier wheat, possessing many good qualities, its remarkable productiveness being of special interest. It gives a rich-looking, yellowish flour of good strength, but not equal to the strongest varieties. In spite of its many admirable qualities, the fact that it possesses a pale, yellowish skin prevents us from advising farmers to grow it for export, because the Canadian grain inspection laws are based on the idea that wheats with a pale skin are usually of inferior quality, and the regulations in regard to the grading are so worded as to make it practically impossible for any farmer to obtain a fair price for a yellow (or so-called 'white') wheat, in what is known as the Manitoba Inspection Division. Bishop has succeeded remarkably well at almost all points where it has been tested. As an instance of special interest, I may mention that a large yield per acre of grain weighing 65 pounds to the measured bushel was obtained from this variety last season at Lesser Slave Lake in a latitude about 400 miles farther north than Winnipeg. No doubt it will succeed very well much farther north than this.

These new varieties and new strains of the older sorts are now being propagated for free distribution. Most of them were available to a limited extent for that purpose last winter. At present it appears that Marquis may take the lead as the best for export purposes of all the early sorts yet introduced, unless the selected form of Red Fife, mentioned later in this paper, should prove equally early. These two varieties are very much alike, though of quite distinct origin.

In addition to the six varieties of wheat mentioned by name, which have all sprung from crosses made in the earlier years of the existence of the Experimental Farms, we have now on hand a large number of very promising varieties which have been produced from crosses made by the writer in more recent years. About 200 of these new sorts are now being propagated for further test, and these will probably soon be followed by several hundred others, from the progeny of the most recent crosses which at the present time are not quite fixed in type. Of course it is not our intention to retain more than a few new varieties, adapted to the various conditions of soil and climate in Canada. The task of eliminating the less desirable sorts will, therefore, be rather lengthy and difficult, especially as the baking strength of the flour must be considered in nearly all cases.

When this work was commenced, the strength of the flour from any wheat could not be determined until quite a large quantity of grain was available and even then we were dependent on the mere opinion of some commercial baker, not usually a trained scientist, as to the characteristics and value of the flour. Now, however, with the introduction of the small experimental flour mill and the development of a scientific method of determining baking strength, this matter can be investigated much earlier in the history of each variety, and the conclusions reached are far more trustworthy than before. All new varieties intended for bread-making are now tested in the baking laboratory before being distributed. In addition to the final baking tests, I have employed for several years a simple chewing test (using only a few kernels of wheat) as a valuable guide to gluten strength and probable baking strength in the earlier stages of selection. This test was advocated as an essential aid in the selection of cross-bred varieties of wheat in the bulletin on Quality of Wheat, published at Ottawa, October, 1907.

The practical results already reached by the introduction of early-maturing wheats are of considerable importance, since the new varieties here referred to can be depended upon to ripen in some of those sections of country where the old, standard variety Red Fife is often caught by frost. By the use of these earlier kinds, the areas of profitable wheat culture have been extended. Furthermore, a small acreage of some

of the new sorts may be advantageously sown, especially on stubble land, even in districts where Red Fife succeeds fairly well, so as to lengthen the harvesting season when labour is scarce; but, with the possible exception of Marquis, none of the new cross-bred sorts thus far introduced can be recommended to replace Red Fife in localities where that variety can usually be ripened.

As an instructive proof of the value of early-maturing wheats, some results obtained last season on the Experimental Farm at Lacombe in Central Alberta may be cited. All the spring wheat on that Farm was somewhat blemished by frost with the exception of one early variety. This wheat, known as Downy Riga, was cut before the first frost. The kernels were plump and bright with a smooth skin and weighed 63½ pounds to the measured bushel. Among the early varieties which ripen later than Downy Riga, we may take Huron as a good example. This wheat was so well advanced at the time of the frost that the kernels when threshed were found to be quite plump and weighed 62 pounds to the measured bushel. The bran was, however, so much roughened by the frost that the wheat would have been graded quite low if offered for sale. Red Fife from the same series of plots was very seriously damaged by the frost, the kernels being rather shrivelled and the bran somewhat rough. The weight of a measured bushel of this wheat was only 58½ pounds, and the yield 18 bushels per acre. Downy Riga gave 31 bushels and Huron 37½ bushels per acre.

While the results achieved thus far are of great value, still further advances are expected in the near future. Some of the new, hard, red, early wheats derived from the writer's recent crosses are to be ground and baked during the coming winter, and it is expected that from 50 to 100 new sorts will be tested in this way every year for several years to come. Out of this large number we may confidently look forward to the discovery of at least a few varieties which will surpass any of those yet known by combining all the good qualities needed in an early-maturing wheat for export.

Though it is true that cross-breeding is quite essential when one wishes to produce new varieties of wheat which shall be radically distinct from any existing sorts, one may occasionally isolate by mere selection some fairly distinct type (a 'sport' or a 'mutant') which may be, in certain respects, superior to the variety out of which it was selected. A considerable amount of selection has been carried on at Ottawa, and, though on the whole the practical results of this work have been much less than those obtained from cross-breeding, one at least of the new strains produced by simple selection promises to be of importance, and ranks in interest with the cross-bred sorts. This is a strain of Red Fife wheat originated from a single early-maturing plant found by the writer in 1903. This strain has been thoroughly tested both in the field and in the baking laboratory and has been proved to be genuine Red Fife in all essential respects. It, however, ripens earlier and shows certain other minor points of difference, but would be generally recognized as Red Fife. This wheat has now been grown for six years at Ottawa and was tested during the present season at Brandon also. Though we do not yet know what its average yield will be, it is a strong grower and promises well. Its advantage in earliness over common Red Fife is only a few days under ordinary conditions, by no means sufficient to meet the needs of all districts, but quite enough to establish the value of the new selection and to create a large demand for it. It has been named Early Red Fife and will, it is expected, be available for general distribution in small quantities after the next harvest, only a few bushels of seed being now on hand.

It would be quite in accord with popular ideas if we were to carry on repeated selections of Early Red Fife for earliness through several years or decades in the hope of obtaining still further advances in that direction. Unfortunately, while improvement by such a method is perhaps not quite impossible, there are good grounds for believing that the further advances would 'tease the patience of the centuries' before any striking results would be obtained. Early Red Fife did not, in all prob-

ability, acquire its earliness by degrees, but at one step, at the same time as its other points of difference from the parent variety were manifested. In introducing this variety I do not claim that I have improved Red Fife wheat, but that I have discovered and isolated an improved type which had previously been mixed with the ordinary form. It is from cross-breeding followed by selection that one may expect the greatest advances in the direction of any desired change, and it is to cross-bred varieties, therefore, that we must look for still earlier wheats of high baking strength.

Leaving now what may be called the practical side of the subject (though the attempt to distinguish sharply between practical and scientific results is rather objectionable and at times misleading), we may turn to some of the observations of a scientific character which have been made during the progress of this work. While in many cases observations and descriptions which would have been of value have been unavoidably omitted or seriously curtailed, owing to the pressure of other aspects of the work, nevertheless some facts of scientific interest have been noted from time to time. Since the work has been done on a large scale it is not surprising that some of the observations made are in disaccord with those of my predecessors and co-workers in other parts of the world. The number of cross-bred kernels of wheat which I have produced thus far is over three hundred. The many thousands of descendents raised from these have given opportunity to make observations of a varied character and to discover some irregularities which might have escaped notice in any small series of experiments.

In regard to the inheritance of awns, I have already presented elsewhere a summary of the facts observed, and I wish at this time merely to repeat the statement that awns and the absence of awns do not necessarily form a pair of Mendelian unit characters, but that an intermediate condition is quite common (in wheats of cross-bred origin) in the first generation and also in succeeding generations.*

In reference to the inheritance of baking strength I have recently had occasion to present some facts for publication in one of the scientific journals, and it is therefore unnecessary to give more than a brief summary of my views on this occasion. In this matter, as in the study of the inheritance of awns, my work has been of an unusually extensive character, and has led to conclusions at variance with those arrived at by some other students of the same problem. It has been asserted that strength and weakness of flour form a pair of Mendelian unit characters. Even after making all due allowance for the necessarily somewhat indefinite meaning of the words *strong and weak,* it seems impossible to accept this view. If it were true, it would lead to the saving of a large amount of time in working out some of the problems of wheat breeders. But, after having studied with great care several of our cross-bred wheats produced by crossing a strong with a weak variety, I have failed to find one which has inherited the full baking strength of the strong parent. The baking strength has usually been found to be intermediate between the two parents, quite far enough from both extremes to avoid any possible doubt. The baking tests have been made entirely by myself and have been quite elaborate, having involved the making of some hundreds of test loaves through several years. The results are the more striking when we remember that all the cross-bred varieties tested were selected originally by the chewing test as having gluten which in strength approached nearest to that of the strong parent.

These tests were, of course, conducted with pure, fixed strains propagated from single plants and showing a remarkable degree of uniformity. While it is to be regretted that baking strength does not act as a simple Mendelian character, it would indeed be most surprising if it were so, in view of the fact that it depends not only

* The half bearded condition may, of course, be described as a case of 'incomplete dominance.' But such a description is little better than playing with words, and admits all that the present writer contends; namely, that beardlessness is not always dominant in the first generation. Half dominance is, of course, no dominance at all.

on the quantity and quality of the gluten, but is greatly influenced by other factors such as climate and storage, and that the weak flour of to-day may be completely transformed by being kept for a year, and may be in the very highest class for strength the following season.

I am a strong believer in the value of Mendel's observations, but cannot help feeling that the supposed discovery of Mendelian unit characters is sometimes due to the unhappy combination of a great deal of enthusiasm with very few facts. It is essential that many observations should be made and that the 'exceptional' cases should be taken into account—especially when they are in the majority.

Among other irregularities in inheritance, two may be mentioned which occur so frequently as to suggest that they may perhaps be *regularities* after all. When two varieties of wheat having reddish bran are crossed, it often occurs that in the second and later generations some of the progeny have yellowish bran. In regard to awns a somewhat similar phenomenon is often observed, namely, the appearance in the second and later generations of fully bearded plants, both the parent varieties having been practically awnless. In such cases I have never witnessed the production of intermediate or half-bearded types which are so common when bearded and beardless sorts are crossed. Perhaps the occasional production of downy chaff when two varieties with smooth chaff have been crossed may also belong in this same category, though it appears to be less common.

While it is somewhat unsatisfactory to report upon work which is yet so far from completion (using that term in a very loose sense of course) and which indeed is now just reaching the period of greatest interest, during which the most rapid advances may be expected, I have endeavoured, nevertheless, to make clear to you the aim and scope of the work in wheat breeding which I am carrying on and also to give you some idea of the progress which has thus far been made and of the results of practical and scientific interest which have been obtained. Very much yet remains to be done before even the most urgent needs of Canada shall have been met, but in view of the advances that have already been made we may look confidently to the future for a decided improvement in the character of the grain produced in many sections where wheat is now being cultivated, and also for a great extension of profitable wheat growing into districts where at present the high altitudes or high latitudes are a bar to the successful cultivation of this most important cereal.

CROSSING AND SELECTION OF CEREALS.

The principal crosses made last season were between Red Fife wheat and Persian Black for the purpose of studying the inheritance of chaff colour. This problem is rendered very difficult owing to the fact that the true colour of the chaff is often obscured by the effects of unfavourable weather or disease. It is hoped, however, that the parents chosen for this experiment are sufficiently diverse in chaff colouration to make accurate observations possible.

The crosses made the previous season between different selected strains of Red Fife wheat were successfully grown last year. Most of the plants were quite healthy and some of them showed distinctly that they were true crosses, as they had inherited from the male (or pollen) parent a type of head distinctly more blunt than that of the female (or seed) parent. As a rule, one cannot be quite certain that a cross within a variety has been effected even when all possible precautions have been taken. Indeed it is probable that many of the supposed crosses within a variety have been fertilized with pollen from the same flower or from other flowers of the same plant. It will be interesting to follow the history of these new crosses to see whether they show any peculiar tendencies or any unusual vigour. So much has been said in Canada of late years in regard to the supposed weakening of cereals by

repeated self-fertilization year after year and the supposed necessity for renewing the vitality of the seed by crosses within the variety, that it seems desirable to point out that such assertions are to be regarded as mere expressions of opinion without any substantial foundation. It is absurd to argue that because unnatural in-breeding is sometimes dangerous in animals, therefore the perfectly natural self-fertilization in cereals must necessarily be open to the same objections. Self-fertilization is the rule in cereals, but it has been clearly proved by scientific workers in various countries that cross-fertilization occasionally occurs. Several striking cases of this have come under the observation of the writer. It has, however, never yet been demonstrated that cross-fertilization is necessary in cereals for the maintenance of vigour.

Considerable work in selection was carried on during the past season, but this subject was so fully discussed in the annual report for last year that detailed references to it are unnecessary at the present time.

SPECIAL DISTRIBUTION OF SEED GRAIN.

As announced last year, the Cerealist is prepared to send by mail small samples of seed of the very best strains and of the highest degree of purity to farmers who are in the habit of growing seed grain for sale and who are prepared to handle such unusual grain with the care it deserves. Such seed cannot be sent out in quantity, by the bushel, as the amount on hand is always, necessarily, very small. Most of it is grown at Ottawa under the immediate care of the Cerealist, and represents the results of the best methods of breeding and selection. Farmers desiring grain to use as a basis for experiments in selection are not advised to commence their operations with these special strains of seed which are already so highly selected that they cannot be expected to respond readily to any further work of that kind. This special seed should be propagated as rapidly as possible without selection, but giving great care to the maintenance of its purity. Farmers desiring a sample of this special seed should state the name of the variety they wish, or the particular qualites which they desire. It is hoped that there will be available next season several varieties of wheat and one or two sorts of barley and of oats for this distribution.

MILLING AND BAKING TESTS.

Since the last report was written a new laboratory has been fitted up for carrying on the baking tests. There has been provided a larger and better oven, heated by electricity, and so constructed that the temperature can be easily controlled and kept fairly constant. Other improvements in apparatus have also been made, so that the work can now be carried on more easily, with greater accuracy and on a larger scale than before.

The number of milling and baking tests conducted this year was unusually large, and it is therefore thought best to reserve a detailed account of them for some future publication, and to refer here to only a few of the most important observations and conclusions.

TESTS OF NEW AND STANDARD VARIETIES OF SPRING WHEAT.

Milling and baking tests were made of fifty new, unnamed, cross-bred varieties of spring wheat and of a considerable number of named varieties as well. In the following table a few particulars are given in regard to some of those sorts which stood highest in rank. They are all of the 1909 crop. It will be noticed that several of the new, cross-bred varieties produced stronger flour than any of the samples of Red Fife tested, and in several cases the colour of the bread from the cross-bred wheats

was also remarkably good. The propagation of these phenomenally promising wheats will be pushed as rapidly as possible. Most of them ripen very much earlier than Red Fife and give a good yield of hard, red kernels. Their hardness as compared with Red Fife is roughly indicated by the percentage of break flour obtained. Only one of them, 86 D 2, yielded soft flour, but this is a most unique type, as the softness is here associated with high baking strength.

The very high baking strength of Kubanka, the only Durum wheat in the list, should be noted. The low mark given to this variety for colour is not an expression of the Cerealist's personal opinion, but merely an attempt to indicate the probable rank of the bread from an ordinary commercial standpoint. The bread was of a rich, attractive, bright yellowish colour.

The varieties are arranged in the table in the order of their rank for baking strength as determined according to the method described in Bulletins 57 and 60 of the Experimental Farm series.

TESTS OF NEW AND STANDARD VARIETIES OF SPRING WHEAT.

Milling number.	Variety.	Where Grown.	Break Flour per cent.	Baking strength of flour.	Colour of bread inside.
339	135 B (Gehun Downy x Fraser)	Ottawa	11·0	103	91
336	378 A (Downy Riga x Red Fife)	"	11·0	102	97
292	354 C (Downy Riga x Red Fife)	"	9·9	102	91
263	Kubanka (durum)	"	4·1	102	90
335	195 F (Riga x Preston)	"	13·0	101	96
320	397 D (Downy Riga x Percy)	"	7·7	101	94
297	128 B (Gehun Smooth x Prospect)	"	11·1	100	99
279	Early Red Fife	Brandon, Man	9·0	100	97
323	83 E (Red Fife x Downy Riga)	Ottawa	10·9	100	95
255	Red Fife H	"	13·0	99	99
322	107 A (Gehun Smooth x Preston)	"	8·9	99	95
257	199 B (Riga x Preston)	"	10·2	99	90
266	410 B (Downy Riga x Preston)	"	9·8	97	98
273	Red Fife	Indian Head, Sask	13·5	97	98
341	86 D 2 (Red Fife x Downy Riga)	Ottawa	13·9	97	96
325	363 E 1 (Downy Riga x Red Fife)	"	8·3	97	96
303	197 C (Riga x Preston)	"	10·0	97	91
305	129 D (Gehun Smooth x Prospect)	"	5·7	96	96
307	Red Fife (ordinary seed)	"	10·3	96	95

EFFECT OF STORAGE ON WHEAT AND FLOUR.

The experiments which have now been going on for several years to determine the effect of storage under various conditions on the baking strength of flour have been continued this year, and a new series has been added to the tests in order to gain further information on some points not yet made clear.

The results this season of the baking tests of the stored samples confirm the conclusions of previous years as to the beneficial effect of storage on colour of flour and on baking strength, whether the material is kept as flour or as wheat. It is evident that, under proper conditions of storage, wheat and flour continue to improve for considerably more than a year.

DAMP WHEAT.

Two new series of damp wheat tests were carried on. The results obtained agreed with those of the first series, reported upon last year, and showed that wheat can be subjected to a very considerable amount of dampness, or actual soaking in water, with-

out causing the flour to lose any of its baking strength, while under certain conditions a distinct gain in strength is observed. Some light was thrown on the cause of this gain by the discovery that the addition of a very small amount of malt flour to the flour made from the original sample of wheat (which had not been rendered damp) produced bread almost identical with that made from the damp wheat without the addition of malt. The addition of malt flour to the samples of flour made from the damp wheat produced little or no effect.

INFLUENCE OF FERTILIZERS ON FLOUR STRENGTH.

A series of tests was carried on to ascertain whether the degree of fertility of the soil on which wheat was grown, or the addition to the soil of any particular fertilizer would have any appreciable influence on the baking strength of the flour.

Without attempting to give at present any of the details of these tests, the general conclusions drawn from them may be stated; namely, that no striking influence was observe from any form of fertilizer and that exhausted soil produced flour of unimpaired baking strength.

ARTIFICIAL BLEACHING OF FLOUR.

Since a good deal of public interest has been aroused in the artificial bleaching of flour, some rather extensive tests were undertaken to determine what effects such bleaching might have upon the bread-making qualities of any sample of flour. The only method of artificial bleaching commonly used is by means of nitrogen peroxide generated by the decomposition of nitric acid, or, more frequently, by subjecting air to what is called a flaming discharge of electricity, which brings about a combination between very small portions of the nitrogen and oxygen of the air. The air which has been so treated and which contains a little nitrogen peroxide is passed through a rotating cylinder where the flour is kept in constant motion. The flour is subjected to the action of this air for about fifteen seconds, but the bleaching is practically instantaneous.

Through the courtesy of the Alsop Process Company, the owners of the Canadian patents covering this process, some samples of different types of flour were bleached for the writer (in his presence), last December. Only half of each lot of flour was bleached, the remainder being kept for comparison.

Six lots of flour were treated—a high grade patent flour from Manitoba spring wheat, a soft flour made from Ontario winter wheat, and four samples produced in the experimetnal flour mill belonging to this division, from different types of spring wheat. After having been stored for about three weeks under the usual laboratory conditons, repeated baking tests were made of the bleached and unbleached samples of flour.

Without giving at this time the exact figures obtained, it may be said that the bleached samples showed no distinct differences from the unbleached, except in the colour of the flour and bread which was always less creamy or less yellowish in the case of bleached samples. In some instances, the bleached flours appeared to be very slightly stronger for bread making than the unbleached, and in others they appeared to be very slightly weaker, but the differences observed were all extremely slight and probably within the limits of unavoidable experimental error. Certainly the artificial bleaching, while giving to the flour a paler tint somewhat like that which is produced by natural bleaching, does not impart the increased strength which flour almost always obtains from prolonged storage under good conditions. On the other hand, it is equally clear that artificial bleaching, properly carried out as in the samples

examined, does not appreciably injure the bread-making strength of the flour. Bleaching had no effect, so far as could be observed, on the flavour of the bread.

This subject is of such importance that a full discussion of it is necessary. This must, however, be reserved for some later publication.

SMALL PLOTS OF CEREALS.

In addition to the very numerous plots of cereals of cross-bred origin which are not yet fixed in type, there were grown at Ottawa last year in plots of less than 1/60 of an acre:—

28 selected strains from named varieties of spring wheat.
222 new cross-bred varieties of spring wheat.
23 selected strains from named varieties of oats.
21 new cross-bred varieties of oats.
45 selected strains from named varieties of barley.
80 new cross-bred varieties of barley.
24 new cross-bred varieties of peas.
3 selected strains from named varieties of beans
20 selected strains from commercial sorts of flax.

Making a total of 119 selected strains and 347 new cross-bred varieties.

UNIFORM TEST PLOTS OF CEREALS, &c.

The most important varieties of cereals, field roots, &c., which are obtainable in commerce are grown every year in test plots along with the cross-bred and selected sorts produced at this Farm and other varieties obtained from various sources. The objects of these tests are to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, in order to keep the list within as small bounds as possible.

The test plots of grain are one-sixtieth of an acre and those of field roots one-hundredth of an acre.

The number of these test plots grown during the past season was as follows: spring wheat, 31; durum wheat, 3; winter wheat, 13; emmer and spelt, 8; oats, 36; six-row barley, 17; two-row barley, 23; peas, 21; spring rye, 3; winter rye, 3; field beans, 4; turnips, 25; mangels, 26; carrots, 11; sugar beets, 6; Indian corn, 41; making a total of 271 plots and representing about 200 varieties.

The number of grain plots has now reached the lowest point for many seasons, owing to the steady elimination of the less desirable sorts during the past few years. A considerable increase in the number will occur this coming season, now that some of the new cross-bred varieties produced since the establishment of the Cereal Division are ready to take their places in these larger plots.

WEATHER.

The spring of 1909 was very backward, chiefly owing to the unusual quantity of rain which delayed the sowing of grain some weeks beyond the proper time. It was nearly the middle of May before the first plots were sown.

Fortunately the summer proved exceptionally favourable, so that, on the whole, fair crops were obtained in spite of the late seeding, which under ordinary circumstances would have proved disastrous.

SPRING WHEAT.

EARLY RIPENING VARIETIES.

Marquis proved remarkably successful at many points last season, the yield of over 200 bushels from a 4-acre field on the Brandon Experimental Farm being worthy of special notice. Several farmers in Northern Saskatchewan grew it with unusually good results. The best sample which reached the Cerealist's office was grown by Mr. E. B. Cay at Beatty, Sask., and showed the phenomenal weight of 66¼ pounds to the measured bushel. Other very fine samples were received from Mr. Martin Dornian, of Disley, Sask. (65 pounds per bushel), and from Mr. L. T. Symonds, of Marshall, Sask. (64¾ pounds per bushel). In addition to its earliness, Marquis wheat is very desirable in certain sections on account of its somewhat shorter straw than Red Fife. Its good appearance and excellent baking records have been discussed in previous reports.

Taking all points into consideration, Marquis wheat is recommended as the most promising sort at present available for farmers who require a hard, red wheat of high baking strength and ripening earlier than Red Fife.

Early Red Fife, which is a selection from Red Fife and was produced by propagation from a single conspicuously early plant, is similar to Marquis in many ways. It has not yet been quite so thoroughly tested, but may prove equal to or even better than Marquis. A limited distribution of five pound samples of Early Red Fife is expected to be made next December.

Preston, Huron and Stanley, by careful reselection, have been considerably improved and are excellent varieties from nearly all points of view. Under ordinary conditions, however, they do not produce flour of the highest baking strength, a disadvantage the seriousness of which can easily be exaggerated, but which should not be overlooked in those districts where wheat is grown for export and where a reputation for remarkably high baking strength has already been established. This applies particularly to the central parts of Canada. For the Atlantic and Pacific provinces, these varieties can be recommended as superior to most of the sorts commonly grown. Preston and Huron are bearded wheats, but are particularly vigorous and productive.

Percy and Chelsea are very good early varieties, which have failed, however, to display such distinctive qualites as would necessitate their continued cultivation. These sorts have, therefore, been withdrawn from the distribution.

Bishop is a very early beardless wheat which has given exceptionally high yields and is deserving of attention in those parts of Canada where there is no prejudice against 'white' varieties. Although of a pale colour, this is not a soft wheat.

SPRING WHEAT—TEST OF VARIETIES AT OTTAWA.

Owing to continued wet weather the plots were not sown until May 14. The seed was used at the rate of about 1½ bushels to the acre. The soil was a loam of medium character.

Varieties without names are new cross-bred sorts produced by the Cerealist, but which are not yet ready for distribution. Those varieties which have a letter after the name are new strains propagated from single selected plants.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

The character of the straw is indicated by marks on a scale of 10 points, according to the proportion of the plot standing erect at harvest time.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

SPRING WHEAT.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
					In.		In.	Lb.	Bush.	Lbs.	Lbs.	
1	Early Russian*	Aug.	17	95	48	4	3½	2370	39	30	61	Badly.
2	Huron Selected*	"	20	98	48	9	3¾	2100	35	..	62	"
3	Marquis*	"	17	95	46	10	3½	2040	34	..	60	Considerably.
4	Aurora*	"	6	84	40	7	3	1950	32	30	56½	Slightly.
5	Ebert Selected*	"	7	85	44	9	3½	1950	32	30	59	"
6	Preston H*	"	14	92	43	10	3½	1950	32	30	60¾	"
7	Outlook*	"	24	102	46	8	3½	1860	31	..	61	"
8	Bishop A*	"	13	91	52	6	3¼	1830	30	30	60½	"
9	Hungarian White	"	20	98	47	6	3½	1830	30	30	61	Badly.
10	Prospect*	"	9	87	44	10	3½	1830	30	30	59½	Considerably.
11	Percy A*	"	17	95	47	10	3¾	1800	30	..	60¼	Slightly.
12	Pringle's Champlain C*	"	14	92	40	9	3½	1710	28	30	61½	"
13	Downy Riga*	"	7	85	43	6	3¼	1680	28	..	60	"
14	Bobs	"	16	94	47	9	3½	1650	27	30	61	Considerably.
15	Chelsea*	"	16	94	47	4	3½	1620	27	..	60½	"
16	Stanley A*	"	17	95	42	10	3½	1500	25	..	57¼	Slightly.
17	Gatineau*	"	26	104	47	3	4	1440	24	..	59	Considerably.
18	Red Fife H*	"	25	103	43	10	3½	1410	23	30	58¾	"
19	9 G*	"	20	98	45	10	2¾	1350	22	30	57½	"
20	Alpha Selected*	"	20	98	50	8	3½	1350	22	30	57	Badly.
21	Early Red Fife*	"	17	95	40	10	3½	1350	22	30	58½	Considerably.
22	Yellow Cross*	"	14	92	39	10	3	1230	20	30	61¾	Slightly.
23	Red Fife M*	"	26	104	43	10	3½	1140	19	..	58¼	Considerably.
24	Yellow Fife*	"	6	84	41	10	3¼	1140	19	..	58	Slightly.
25	Yellow Queen*	"	12	90	43	10	3¼	1140	19	..	62	Considerably.
26	White Fife C*	"	26	104	40	10	3½	960	16	..	58¼	"
27	7 E 3*	"	23	101	44	8	3½	750	12	30	57	"

The average yield of the 27 plots was 1,590 lbs. (26 bush. 30 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF SPRING WHEAT.

Excluding the durum wheats, which are considered separately, the following varieties of wheat have shown unusual productiveness for a series of years on this Farm: Preston, Pringle's Champlain, Huron and Bishop. The first three of these are hard red wheats with bearded heads. Bishop is a very early white wheat and is beardless. Of the four varieties Pringle's Champlain is probably the best for the production of strong flour.

Somewhat lower in yield, but superior in the strength of their flour, are Red Fife, Marquis and White Fife, all beardless.

EARLIEST VARIETIES OF SPRING WHEAT.

Some of the very early kinds of spring wheat grown on this farm are not at present being distributed or recommended for general cultivation. Farmers applying for very early sorts should remember that extreme earliness is frequently associated with a rather small yield, short straw, liability to rust or some other defect to which the more vigorous wheats are less subject.

The earliest wheats which are included in the regular distribution of seed grain from this Farm are Marquis and Stanley (beardless and having red kernels), and

Preston, Huron and Pringle's Champlain (bearded and having red kernels). Bobs and Bishop are early beardless sorts which are not generally distributed, because the pale colour of their bran would cause them to be graded below their actual value in the Manitoba Inspection Division. Bishop is perhaps the earliest of the seven varieties mentioned, but they are all earlier than Red Fife.

DURUM OR MACARONI WHEAT.

The different varieties of durum wheat are by no means identical in quality, though they are usually considered to be so. Some are particularly good for the making of macaroni, and excellent bread (of a rich, yellowish colour) can be made from others, but some of the varieties are not very good for either of these purposes Kubanka (Beloturka) is one of the best for bread making and for macaroni.

The extreme hardness of these wheats and the yellowish colour of the flour produced from them make them quite unpopular at present with both millers and bakers.

Farmers who grow durum wheat should obtain one of the best varieties and should exercise great care to prevent the grain from becoming mixed with wheat which is to be sold for the making of ordinary flour.

As a rule, the durum wheats suffer less from drought and from rust than other sorts. They may, therefore, prove useful in some cases, especially in any rather dry districts where rust is apt to be severe. They are not, however, to be recommended for damp climates. It should also be borne in mind that the market price of durum wheat is usually lower than that paid for varieties which are popular for milling purposes.

Several of the varieties which have been shown to be inferior to the others have been discontinued.

The plots of durum wheat were sown on May 13, the seed being used at such a rate as would be equivalent to $1\frac{3}{4}$ bushels per acre of seed of high vitality. The climate at Ottawa is usually too damp for these wheats and the seed saved is generally of rather low vitality. The soil was a loam of fair quality.

The yield per acre is expressed in pounds and in 'bushels' of 60 pounds.

DURUM WHEAT.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Roumanian	Aug. 26.	105	52	7	$2\frac{1}{4}$	2,190	36	30	62	Slightly.
2	Goose	" 24.	103	50	7	$2\frac{3}{4}$	1,920	32	00	61	"
3	Kubanka	" 25.	104	46	7	$2\frac{1}{2}$	1,860	31	00	61	"

The average yield of the three plots was 1,990 lbs. (33 bush. 10 lbs.) per acre.

The variety called Roumanian has given the highest average yield at Ottawa during the past five years. It is, however, of poor quality for bread and probably also for macaroni and should not be grown for any but feeding purposes.

WINTER WHEAT.

Several of the varieties which have been found to yield flour of low baking strength have been dropped from the list.

The plots of winter wheat were sown on August 25, 1908, the seed being used at the rate of about 1¾ bushels to the acre. The soil was a rather heavy loam. The very dry weather which occurred in the month of September, 1908, interfered with good germination and growth. The early part of the winter was changeable in character, so that the plots suffered considerably at that time. Under such circumstances, a uniformly high yield from the plots was not to be expected. Good results were, however, obtained in most instances.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

WINTER WHEAT.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Tasmania Red..........	Aug. 1.	341	46	6	3¾	3,000	50	0	62½	Slightly.
2	Jones' Winter Fife.....	July 29.	338	50	10	3½	2,940	49	0	61¼	"
3	Red Velvet Chaff.......	Aug. 2.	342	47	10	4½	2,760	46	0	60½	Consid'ably.
4	American Banner	July 30.	339	49	10	3¾	2,640	44	0	60¾	Slightly.
5	Imperial Amber........	" 29.	338	55	10	3½	2,610	43	30	62¾	"
6	Buda Pesth....	Aug. 2.	342	50	10	3½	2,520	42	0	61¾	"
7	Egyptian Amber.......	July 30.	339	52	10	3½	2,490	41	30	62	Consid'ably.
8	Turkey Red No. 380....	Aug. 2.	342	42	6	3	2,490	41	30	63¾	Slightly.
9	Dawson's Golden Chaff.	July 30.	339	47	10	3¾	2,460	41	0	61	Consid'ably.
10	Early Red Clawson.....	Aug. 2.	342	46	10	3½	1,650	27	30	59¾	Slightly.

The average yield of the ten plots was 2,556 lbs. (42 bush. 36 lbs.) per acre.

RECOMMENDED VARIETIES OF WINTER WHEAT.

The climate of Ottawa being rather too severe for the regular production of good crops of winter wheat, the average yields obtained here would scarcely serve as a satisfactory guide for farmers in southern Ontario. Some recommendations in regard to varieties of winter wheat may, however, be given.

One of the best varieties in the field is Dawson's Golden Chaff (beardless). It has the disadvantage, however, of giving flour which is low in baking strength and therefore suitable for crackers, cakes, &c., but not for light bread. The gluten content of this variety is not high enough to make it quite satisfactory for the production of rolled wheat and other similar cereal products, though it is used for these purposes.

Turkey Red (bearded) yields the strongest flour, but does not as a rule give, in Ontario, as large a yield of grain per acre as some of the other sorts.

Egyptian Amber (bearded) and Tasmania Red (bearded) give good yields of grain and produce very good flour for bread making.

Imperial Amber (bearded) is another variety which can also be recommended both for its high yield and the very fair strength of its flour.

EMMER AND SPELT.

The plots of Emmer and Spelt were sown on May 13, the seed being used at the rate of about 120 pounds (or four bushels by measure) to the acre. The soil was a loam of medium character.

Common Emmer (often incorrectly called 'Speltz') is one of the best varieties, being less coarse and containing a larger proportion of kernel than most of the other sorts.

EMMER AND SPELT.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average length of Head.	Yield per Acre.	Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Lbs.	
1	Common Emmer....	Aug. 20.	99	44	8	2	3,090	36	Slightly.
2	Double Emmer........	" 20.	99	44	7	1¾	2,520	27	"
3	9 K 2..................	" 20.	99	40	7	2	2,340	28¼	"
4	Red Emmer............	" 30.	109	50	8	3¼	2,250	33	"
5	9 J 3	" 16.	95	46	4	3¾	2,100	32½	Considerably.
6	White Spelt...........	" 29.	108	48	8	5	1,830	24¼	"
7	Red Spelt..	" 30.	109	48	8	4	1,800	23¾	"
8	Smooth Spelt...... ...	" 26.	105	43	10	5	1,740	24¼	Badly.

The average yield of the 8 plots was 2,209 lbs. per acre.

OATS.

STOOLING OF OATS.

A good deal has been written during the past two years about stooling and non-stooling varieties of oats, most of the assertions made appearing to be founded rather on the desires of the writers than on ascertained facts. An experiment with several varieties was carried out last season for the purpose of gaining some information as to the habits of the different varieties in this respect. The seeds were put in (May 12) 4 inches apart each way in small blocks, each block being of the same size and having the same numbers of inside and outside places. When the plants were mature, the number of stalks produced by each was counted, omitting those very few stalks, which were sometimes found, which were only a few inches long, too short to be of value if harvested by ordinary field methods.

In the following table the average number of stalks per plant is given, the varieties being arranged according to the number of stalks produced. The average number of stalks from the inside plants alone is also given. The outside plants always produced more than twice as many stalks as those inside. The number of outside plants was too small, however, to furnish trustworthy averages for themselves alone.

STOOLING OF OATS.

Variety.	Average number of stalks per plant.	Average number of stalks on each inside plant.
Sixty Day White	4.3	2·9
Daubeney Selected	3·7	2·1
Garton's Abundance, imported seed	2·7	2·0
Banner B	2·7	1·5
Garton's Abundance, grown 5 years at Ottawa	2·6	1·9
Golden Beauty	2·5	1·7
Swedish Ligowo	2·5	1·7
White Giant	2·5	1·5
Golden Giant	2·4	1·6
Thousand Dollar	2·4	1·6
Pioneer	2·3	1·7
Victory	2·3	1·5
Swedish Select	2·3	1·3
Tartar King	1·9	1·2
Wide Awake	1·8	1·2
Storm King	1·6	1·1

While the conclusions drawn from one such series of tests should not be considered as necessarily true for all conditions of soil, weather, &c., the above table allows some interesting deductions.

It is evident that the short, early-ripening varieties tend to produce a large number of stalks per plant. This is especially true of Sixty Day White, which is remarkably early and produces short, light straw. Among what may be called the standard varieties, it is interesting to notice that Garton's Abundance, said to be a non-stooling sort, produced an exceptionally large number of stalks—almost exactly the same number as Banner. Furthermore, the plants from imported seed of Abundance produced rather more stalks than those grown from seed obtained from the fifth crop in this country. This also is quite contrary to the assertions commonly made.

Some of the English varieties, particularly Storm King and Tartar King, produced a very small number of stalks per plant, and may, therefore, be regarded as essentially non-stooling varieties, under ordinary field conditions.

How far one is justified in regulating the rate of seeding according to the stooling properties of the varieties is a question not easily settled. It is evident that the root system necessary to support an average stalk of Storm King must be much larger and must be allowed more room for development than would be required by the roots for a stalk of Sixty Day White. To conclude from the above table that about 2½ times more seeds of Storm King than of Sixty Day White should be sown in the same area of ground would certainly be extremely unwise. The question is much too complicated to be dealt with in that way, and is one for experiment rather than argument.

Experiments have shown that, in the climate of Ottawa, the proper quantity of Banner oats to sow is 2 or 2½ bushels per acre. Other varieties have not yet been thoroughly tested in this regard.

Victory.—The new Swedish oat, Victory, produced at the experiment station at Svalöf, was received two years ago through the courtesy of the United States Department of Agriculture. The first season it was grown in a very small plot, but in 1909 there was sufficient seed for a plot of the usual size. This is a promising white oat with an open head and good habit of growth. It will be noticed that it stands high in the list, for yield, this year.

Early Ripe.—The very early variety Early Ripe has been temporarily withdrawn from the regular test plots as some selections of uniform type are being propagated from it.

Sixty Day White.—This variety is a selection made by the Cerealist from the Sixty Day oat. It is extraordinarily early, perhaps a little earlier than the original mixed Sixty Day, but will usually require eighty days or more to mature in the climate of Ottawa if sown reasonably early. It is not a variety that can be recommended for general purposes on account of its small kernel, very short straw and extreme susceptibility to loose smut. It may, however, be valuable for special uses.

Test Plots.—The oat plots could not be sown until May 18, too late for the growing of a large crop. The seed was used at the rate of about two bushels per acre for most varieties, but in greater quantities whenever the oats were of unusually large size. The soil was a loam of somewhat variable character.

Some of the varieties of less importance have been dropped from the list since last year.

The yield per acre is expressed in pounds and also in 'bushels' of 34 pounds.

*Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

OATS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inch.	Lbs.	Bush.	Lbs.	Lbs.	
1	Thousand Dollar......	Aug. 14.	88	48	5	7	2,280	67	2	30½	Considerably.
2	Irish Victor	" 19.	93	47	9	8	2,250	66	6	31	"
3	Victory	" 17.	91	44	10	7	2,250	66	6	33	Badly.
4	Swedish Ligowo	" 14.	88	45	9	7¼	2,190	64	14	31	Considerably.
5	Improved Ligowo. ...	" 17.	91	43	8	6½	2,130	62	22	30½	"
6	Kendal White*........	" 19.	93	46	7	7	2,130	62	22	29¼	"
7	Milford White*.......	" 17.	91	48	7	8	2,070	60	30	32	Badly.
8	Abundance....	" 18.	92	44	10	8	2,040	60	0	29½	"
9	Lincoln...............	" 17.	91	44	8	7	2,040	60	0	29½	"
10	Wide Awake	" 16.	90	45	8	7¾	2,040	60	0	30¾	Considerably.
11	Daubeney Selected*...	" 10.	84	42	8	7½	2,010	59	4	31	Slightly.
12	Improved American...	" 18.	92	43	10	7¼	2,010	59	4	30	"
13	Pioneer	" 14.	88	42	8	6¾	2,010	59	4	32¾	Considerably.
14	Banner B*............	" 14.	88	41	10	7½	1,980	58	8	30	Slightly.
15	Bergs.....	" 14.	88	38	9	7	1,980	58	8	32	Considerably.
16	Mennonite............	" 18.	92	45	9	7¼	1,980	58	8	29¾	"
17	Siberian	" 18.	92	44	8	7¼	1,980	58	8	30	Badly.
18	Sixty Day White*.....	" 6.	80	36	9	6	1,980	58	8	27¾	Slightly.
19	Tartar King........	" 13.	87	44	8	7½	1,980	58	8	32	Considerably.
20	Tlola.	" 11.	85	50	5	9	1,980	58	8	29	"
21	Kirsche..............	" 19.	93	45	8	8	1,950	57	12	31	Badly.
22	American Triumph....	" 14.	88	40	10	7¼	1,920	56	16	30½	Considerably.
23	White Wonder	" 10.	84	46	6	8	1,920	56	16	37¼	"
24	Black Mesdag	" 11.	85	44	6	8	1,890	55	20	31¼	"
25	Danish Island	" 18.	92	38	8	7	1,890	55	20	30	"
26	Gold Rain......... ..	" 16.	90	42	10	6½	1,830	53	28	34¾	"
27	Swedish Select........	" 13.	87	41	10	7	1,830	53	28	31	"
28	Storm King.....	" 17.	91	46	6	7¼	1,800	52	32	32	"
29	Virginia White.. ..	" 16	90	45	6	6¼	1,800	52	32	30¾	"
30	Garton's Abundance..	" 14.	88	38	10	6¼	1,680	49	14	30¼	"
31	Dinauer	" 17.	91	38	9	6¾	1,620	47	22	30	Badly.
32	Golden Beauty...... .	" 17.	91	38	9	7	1,590	46	26	29¾	"
33	White Giant Selected*	" 17.	91	40	10	7½	1,560	45	30	31	Considerably.
34	Twentieth Century....	" 14.	88	45	9	7½	1,500	44	4	30½	"
35	Excelsior.............	" 14.	88	34	10	6½	1,320	38	28	34½	"

The average yield of the 35 plots was 1,926 lbs. (56 bush. 22 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF OATS.

Among the most productive kinds of oats, the following white varieties deserve special mention: Thousand Dollar, Twentieth Century, Improved American, White Giant, Banner, Garton's Abundance and Danish Island. One or more of these kinds can be obtained from any good seedsman. Gold Rain is a very productive yellow oat. Among black oats, the English varieties Pioneer and Excelsior have given the best returns on the Central Farm during the past few years, but they have not proved so productive as the best white kinds.

EARLIEST VARIETIES OF OATS.

The varieties called Sixty Day and Early Ripe are extremely early in ripening, but cannot be recommended for general purposes, though they may be useful in certain special cases.

Somewhat less early, but probably more satisfactory as a rule, are Daubeney and Tartar King. These oats are obtainable in commerce, but farmers will usually find some of the later and more productive varieties to be, on the whole, more profitable.

SIX-ROW BARLEY.

The plots were sown on May 19, the seed being used at the rate of about two bushels to the acre. The soil was a rather light loam.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

SIX-ROW BARLEY.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of ten points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					Inches.		Inch.	Lbs.	Bush.	Lbs.	Lbs.	
1	Claude*	Aug.	11	84	41	10	3¼	3,060	63	36	45¼	Slightly.
2	Albert*	"	11	84	40	10	3½	3,000	62	24	45½	"
3	Manchurian A.*	"	11	84	42	10	3¼	3,000	62	24	45½	"
4	Odessa	"	15	88	40	10	3	2,970	61	42	44	"
5	Oderbruch	"	11	84	42	10	3	2,910	60	30	47	"
6	Nugent*	"	10	83	41	10	3¼	2,820	58	36	46½	"
7	Mandscheuri	"	10	83	40	10	3	2,520	52	24	45½	"
8	Mansfield*	"	12	85	40	8	2¾	2,490	51	42	46	"
9	Mensury	"	10	83	38	10	3	2,190	45	30	45½	"
10	Black Japan	"	10	83	25	10	2	1,950	40	30	43¼	Cons derably.
11	Trooper*	"	17	90	34	10	3	1,950	40	30	45	Slightly.
12	Yale*	"	13	86	40	10	2½	1,950	40	30	47¾	"
13	Bere	"	9	82	35	9	3	1,920	40	—	43	"
14	Eclipse	"	17	90	32	10	3	1,860	38	36	45¼	Considerably.
15	Escourgeon	"	9	82	33	9	2¾	1,830	38	6	43¾	Slightly.
16	Stella*	"	17	90	32	10	3¼	1,680	35	—	45½	"
17	Small Blue Naked	"	15	88	30	8	2¾	1,650	34	18	51¼	"

The average yield of the 17 plots was 2,338 lbs. (48 bush. 34 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF SIX-ROW BARLEY.

Among the most productive sorts which have been tested for several years at this Farm are Mensury, Odessa, Nugent and Mandscheuri. Mensury and Odessa are obtainable from most seedsmen in Canada. The average yield of Mandscheuri for

the past five years has been greater than that of Mensury, but less than that of Nugent. A selected strain of Mensury, which is being grown under the name of Manchurian A, has surpassed the Mandscheuri in average yield for the past four years. Further tests for at least one year will be made before reaching any decision as to the relative values of these barleys.

EARLIEST VARIETIES OF SIX-ROW BARLEY.

The differences in earliness among the varieties of six-row barley are not very striking. Among the earliest sorts are Mensury and Odessa.

BEARDLESS SIX-ROW BARLEY.

Champion is the most productive variety of beardless barley that has been grown here. It ripens early, but usually gives a poor yield and is not to be recommended. It is obtainable in commerce.

HULLESS SIX-ROW BARLEY.

The most productive variety of hulless six-row barley which has been tested at this farm is Hulless Black. This is a bearded sort and can be obtained in commerce. It ripens early, but has weak straw and gives a small yield.

TWO-ROW BARLEY.

The plots were sown on May 20. The seed was used at the rate of about two bushels to the acre. The soil was a loam of medium character.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

TWO-ROW BARLEY.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of ten points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inch.	Lbs.	Bush.	Lbs.	Lbs.	
1	Early Chevalier*	Aug. 9	81	40	7	3¾	2,610	54	18	47	Slightly.
2	Caucasian Hulless	" 9	81	27	5	3¼	2,520	52	24	58½	"
3	Black Two-row	" 20	92	35	8	3½	2,490	51	42	46	Badly.
4	Beaver*	" 11	83	45	10	4½	2,400	50	—	45½	Slightly.
5	Danish Chevalier	" 18	90	46	10	4½	2,400	50	—	46	Considerably.
6	Clifford*	" 11	83	43	8	3¾	2,370	49	18	47½	Slightly,
7	French Chevalier	" 13	85	43	8	3¼	2,310	48	6	48	"
8	Canadian Thorpe	" 18	90	38	10	3¼	2,160	45	—	44¾	Considerably.
9	Gordon*	" 12	84	42	8	2¾	2,160	45	—	46½	"
10	Standwell	" 18	90	40	7	3½	2,100	43	36	47	"
11	Brewer's Favourite	" 20	92	44	9	3¾	2,040	42	24	45½	"
12	Princess	" 23	95	35	4	4	1,920	40	—	46	"
13	Hannchen	" 20	92	35	8	3½	1,890	39	18	45½	"
14	Archer Chevalier	" 23	95	35	9	4	1,830	38	6	45¼	"
15	Invincible	" 25	97	38	8	3	1,680	35	—	46	"
16	Primus	" 26	98	40	8	3½	1,680	35	—	48	"
17	Swan's Neck	" 20	92	37	8	3	1,680	35	—	46	Badly.
18	Leader	" 25	97	40	5	2½	1,680	35	—	45	Considerably.
19	Jarvis*	" 24	96	46	8	4¼	1,650	34	18	46½	"
20	Old Irish	" 25	97	36	8	4	1,650	34	18	45½	"
21	Hofbrau	" 24	96	37	3	4¼	1,620	33	36	46	"
22	Swedish Chevalier	" 24	96	32	8	4	1,530	31	42	47	"
23	Jewel	" 25	97	37	5	3¾	1,290	26	42	43½	Badly.

The average yield of the 23 plots was 1985 lbs. (41 bush. 17 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF TWO-ROW BARLEY.

The following varieties are among the most productive: Hannchen (a Swedish selection of the famous Hanna barley), Swan's Neck, Standwell, Clifford, Canadian Thorpe, Beaver and the different strains of Chevalier.

EARLIEST VARIETIES OF TWO-ROW BARLEY.

Among the earliest sorts are Hannchen, Beaver, Clifford and some strains of Chevalier.

BEARDLESS AND HULLESS TWO-ROW BARLEY.

The varieties of beardless and of hulless two-row barley which have been tested at Ottawa have not, as a rule, shown sufficient strength of straw to make them profitable sorts for farmers to cultivate. The variety called Caucasian Hulless, which has now been tested for three years, has given good yields, but it cannot be recommended without further trial, as the straw has shown decided indications of weakness.

PEAS.

The plots of peas were sown on May 15, the seed being used at the rate of two or three bushels to the acre, according to the size of the pea. The soil was a loam of medium character.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

PEAS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Average Length of Straw.	Average Length of Pod.	Yield per acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Size of Pea.
					Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Arthur Selected*......	Aug. 17.	94	Strong....	53	2¼	2760	46	..	64¼	Medium.....
2	Prussian Blue.........	" 23.	100	" ...	60	2¼	2700	45	..	63	" .....
3	Chancellor	" 23.	100	" ...	65	2	2610	43	30	62½	Small ....
4	English Grey..........	" 30.	107	" ...	70	2½	2580	43	..	62	Medium.....
5	Mackay*....	" 26.	103	" ...	60	2¼	2550	42	30	62	" ....
6	Prince*...........	" 26.	103	" ...	60	2½	2550	42	30	63	Large ......
7	White Marrowfat... .	" 29.	103	Very str'g.	75	2½	2520	42	..	63½	" ....
8	Picton*	" 26.	103	Strong. ..	65	2½	2430	40	30	62	" ....
9	Victoria*.	" 29.	106	" ...	70	2¼	2430	40	30	64	Medium.....
10	Wisconsin Blue...... .	" 29.	106	" ...	65	2	2400	40	..	64	" .....
11	Paragon*......... . ..	" 26.	103	" ...	65	2¼	2240	39	..	63	" .....
12	Gregory*.............	" 31.	108	Very str'g.	75	2¼	2310	38	30	63½	" .....
13	Golden Vine..........	" 29.	106	Strong ..	70	2	2280	38	..	64½	Small ....
14	Canadian Beauty	" 30	107	Very str'g.	80	2¼	2160	36	..	62	Large ... ...
15	Early Britain........	" 30.	107	" .	75	2½	2160	36	..	61¼	Medium.....
16	Daniel O'Rourke	" 26.	103	Strong ...	70	2¼	2130	35	30	63¼	Small ....
17	Zulu	" 25.	102	" ...	70	2½	2100	35	..	60	Large ....
18	Black-eye Marrowfat..	" 31.	108	Very str'g.	75	2½	2010	33	30	63	" ....

The average yield of the 18 plots was 2,390 lbs. (39 bush. 50 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF PEAS.

Prussian Blue, Chancellor, Arthur and Golden Vine can be recommended as good, productive varieties of peas. Golden Vine has not done so well as usual during the last few years, but it is a variety which can usually be depended upon. One or more of the varieties here mentioned can be obtained from almost any seedsman.

EARLIEST VARIETIES OF PEAS.

Arthur, Chancellor and Prussian Blue are among the earliest sorts.

SPRING RYE.

The plots of Spring Rye were sown on May 13, the seed being used at the rate of about 1½ bushels to the acre. The soil was a rather light loam.

The yield per acre is expressed in pounds and also in 'bushels' of 56 pounds.

SPRING RYE.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Common............	Aug. 13.	92	57	7	3¼	2,460	43	52	56¼	Slightly.
2	Ottawa Select........	" 13.	92	58	8	3½	2,280	40	40	55¾	"

The average yield of the two varieties was 2,370 lbs. (42 bush. 18 lbs.) per acre.

WINTER RYE.

Three plots of winter rye were sown on August 25, 1908, the seed being used at the rate of about 1½ bushels to the acre. The rye made fair growth in the autumn and stood the winter well. The soil was a rather heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 56 pounds.

WINTER RYE.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a Scale of 10 points.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Mammoth White......	July 26.	335	70	8	4	3,300	58	52	59	Slightly.
2	Thousandfold...... ..	" 26.	335	65	8	3¾	3,060	54	36	58	"
3	Dominion.............	" 27.	336	65	9	4¼	2,880	51	24	58½	"

The average yield of the three varieties was 3,080 lbs. (55 bush.) per acre.

FIELD BEANS.

Four plots of field beans, one-sixtieth of an acre each, were sown on May 25. The soil was a sandy loam. Only one of the varieties ripened satisfactorily.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

FIELD BEANS.—TEST OF VARIETIES.

Number.	Name of Variety.	Distance between Rows.	Date of Ripening.	Number of Days Maturing.	Average Length of Plant.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
		Inches.		Days.	Inches.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	White Field Selected..	20	....	115	48	4¼	2,700	45	..	68
2	Norwegian Brown Selected..............	16	Aug. 23..	90	12	4½	2,400	40	..	62
3	Marrowfat Selected...	20	....	98	35	3¼	1,950	32	30	67½
4	California Pea Selected	16	....	98	20	3¾	1,770	29	30	67½

The average yield of the four varieties was 2,205 lbs. (36 bush. 45 lbs.) per acre.

FLAX.

The commercial kinds of flax which have been tested in the plots for some years were not of uniform character. It seemed necessary in order to obtain results of definite value to produce uniform types by selection. Several specially promising plants were therefore selected from each plot and from each plant a pure strain was produced. Only these selected strains were grown in the plots last season, but as there was not sufficient seed in any case to sow a plot of the regular size, no report of the yields is made. Other particulars in regard to the best of these new selections will be found in the following table. In addition to the field characters (which are given for the varieties grown under field conditions) determination of the weight of 1,000 seeds and of the oil and protein content were made by the Chemical Division, since the composition of the seed is a matter of considerable importance in estimating the relative values of different varieties and strains. These particulars are given in the last three columns of the table. The varieties are arranged in the table according to their oil content.

Those varieties which were grown under field conditions were sown on May 25, the seed being used at the rate of 60 pounds to the acre. The soil was a sandy loam.

Number.	Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Plants.	Weight per Measured Bushel after Cleaning.	Weight of 1,000 seeds	Protein (N x 6·25) per cent.	Oil Per Cent.
						Grammes.		
1	La Plata A	Aug. 31	98	25	53	8·854	20·25	42·20
2	" C.	" 26	93	26	53½	5·975	21·94	40·82
3	Novarossick B	" 26	93	26	53½	5·511	22·12	39·94
4	La Plata B	" 26	93	24	53½	7·978	21·31	39·76
5	Yellow Seed C					4·501	25·31	38·26
6	" A					4·322	25·75	38·16
7	White Flowering B	Aug. 13	80	28	55½	4·732	23·75	37·85
8	Yellow Seed B					4·239	26·25	37·02
9	White Flowering A	Aug. 13	80	28	55¼	5·159	19·06	36·80
10	Riga B					4·542	27·25	36·70
11	" A					4·254	25·81	36·25
12	Common S	Aug. 19	86	41	56	4·156	27·00	36·01
13	" B	" 13	80	39	56	4·442	26·69	35·77
14	Russian A	" 10	77	32	55¼	4·365	26·06	35·74
15	Common D					3·904	24·00	35·64
16	Russian B	Aug. 10	77	36	55½	4·385	27·43	35·35
17	Riga C					3·912	25·25	35·35
18	Common R	Aug. 19	86	40	56	4·333	27·37	35·28
19	" C					4·245	24·19	34·62
20	" A	Aug. 13	80	39	55¾	4·493	27·56	34·50

FIELD ROOTS.

The advantage of late pulling for field roots having been clearly proved by the experience of several years, comparative tests, by pulling on two different dates about two weeks apart, have been discontinued. All the roots were harvested at the one time but the harvesting was left until quite late, so as to enable the roots to make as large a growth as possible.

The yield per acre of the field roots is calculated from the weight of the crop gathered from one-hundredth of an acre.

The soil on which the field roots were grown was a heavy loam.

It is probable that in some instances varieties which are mentioned in these tables under different names are identical in all essential respects.

In Canada the ton contains 2,000 pounds.

TURNIPS.

Two sowings were made of each variety, the first on June 2 and the second on June 16. The seed was used at the rate of about 4 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 7 inches apart in the rows.

The roots were pulled on October 23.

TURNIPS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Good Luck	48	1,700	30	600
2	Halewood's Bronze Top	31	500	26	800
3	Magnum Bonum	31	500	27	200
4	Jumbo	31	400	30	400
5	Hartley's Bronze	29	1,600	27	——
6	Bangholm Selected	28	1,100	23	1,600
7	Kangaroo	27	1,300	26	1,900
8	Carter's Elephant	27	100	25	200
9	Hall's Westbury	26	100	25	900
10	Mammoth Clyde	25	1,400	21	——
11	Perfection Swede	22	400	20	800
12	Skirvings	21	1,400	19	1,900

The average yield from the first sowing was 29 tons 542 lbs. per acre.
The average yield from the second sowing was 25 tons 1,108 lbs. per acre.

MANGELS.

Two sowings were made of each variety, the first on June 2 and the second on June 16. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 7 inches apart in the rows. The roots were pulled October 21.

MANGELS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Giant Yellow Intermediate	34	600	27	600
2	Mammoth Red Intermediate	33	300	25	1,400
3	Giant Yellow Globe	22	1,400	31	1,100
4	Giant Sugar (Canadian Seed)	32	1,000	31	800
5	Half Sugar White	32	900	30	400
6	Ideal (Canadian Seed)	29	1,000	28	800
7	Perfection Mammoth Long Red	29	800	19	900
8	Gate Post	27	1,600	28	1,200
9	Grimson Champion	27	1,100	25	1,200
10	Prize Mammoth Long Red	24	1,800	21	700
11	Selected Yellow Globe	22	1,800	20	——
12	Yellow Intermediate	19	900	16	1,700

The average yield from the first sowing was 28 tons 1,767 lbs. per acre.
The average yield from the second sowing was 25 tons 1,067 lbs. per acre.

CARROTS.

Two sowings were made of each variety, the first on June 2 and the second on June 16. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 5 inches apart in the rows. The roots were pulled October 22.

CARROTS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Improved Short White	19	1,900	18	——
2	Ontario Champion	19	1,100	18	1,800
3	White Belgian	18	800	16	800
4	Mammoth White Intermediate	16	700	15	900
5	Half Long Chantenay	14	1,900	15	1,000

The average yield from the first sowing was 17 tons 1,680 lbs. per acre.
The average yield from the second sowing was 16 tons 1,700 lbs. per acre.

SUGAR BEETS.

Two sowings were made of each variety, the first on June 2 and the second on June 16. The seed was used at the rate of about 6 pounds per acre. Before sowing, the land was made up in drills 2 feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about 3 inches high they were thinned out, leaving them about 5 inches apart in the rows. The roots were pulled on October 21.

SUGAR BEETS.—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing.		Yield per acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Vilmorin's Improved	15	1,600	13	200
2	French Very Rich	15	1,000	13	1,800
3	Klein Wanzleben	14	1,900	11	400

The average yield from the first sowing was 15 tons 833 lbs. per acre.
The average yield from the second sowing was 12 tons 1,467 lbs. per acre.

INDIAN CORN.

The corn was sown with the seed drill in rows 35 inches apart, and was also sown in hills 35 inches apart each way. When the plants were about 6 inches high they were thinned out, leaving them from 6 to 8 inches apart in the rows, and leaving four or five plants in each hill. The seed was sown June 2, and the corn was cut green for

ensilage September 17. The yield has been calculated from the weight of crop cut from two rows, each 66 feet long. The soil was a rather heavy loam.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this stage of maturity before it is necessary to cut the crop to avoid serious frost.

In Canada the ton contains 2,000 pounds.

INDIAN CORN.—TEST OF VARIETIES.

Number.	Name of Variety.	Character of growth.	Height.	Leafiness.	Condition when cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
			Inches.			Tons.	Lbs.	Tons.	Lbs.
1	Superior Fodder	Very Strong	100	Very leafy	Early milk.	16	1,000	17	100
2	Eureka	"	95	Leafy	"	16	450	17	1,310
3	Wood's Northern Dent	"	95	Very leafy	"	16	340	15	1,900
4	Selected Leaming	Strong	90	"	"	14	1,700	17	980
5	Early Mastodon	"	90	"	"	14	1,260	13	1,720
6	Salzer's All Gold	"	90	"	"	14	710	15	30
7	Champion White Pearl	"	85	Leafy	"	13	1,500	14	490
8	White Cap Yellow Dent	Medium	85	Very leafy	"	13	950	15	1,210
9	Compton's Early	"	80	"	Doughy	12	1,960	13	730
10	Mammoth Cuban	Strong	90	Leafy	Early milk	12	1,850	15	1,130
11	Angel of Midnight	Medium	85	"	Late "	12	1,080	11	1,320
12	North Dakota White	"	80	Fairly leafy.	Early "	12	750	12	1,850
13	Longfellow	"	85	Leafy	Doughy	12	420	13	730
14	Davidson	"	65	"	Ripe	8	830	8	500

The average yield from the rows was 13 tons 1,343 lbs. per acre.
The average yield from the hills was 14 tons 852 lbs. per acre.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming and Longfellow. The seed was sown June 2, and the corn was cut for ensilage September 17. Sixteen rows of each variety were sown; that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 66 feet.

Name of Variety.	Distance between the rows.	Character of Growth.	Height.	Condition when cut.	Weight per Acre.	
	Inches.		Inches.		Tons.	Lbs.
Champion White Pearl	21	Strong	95	Early milk	19	367
" "	28	Very strong	115	"	21	1,065
" "	35	"	115	"	13	1,500
" "	42	"	125	"	21	1,052
Selected Leaming	21	Strong	95	"	17	209
" "	28	Very strong	105	"	20	1,172
" "	35	"	105	"	14	1,700
" "	42	"	125	"	21	1,052
Longfellow	21	Strong	90	Doughy	17	1,910
"	28	"	95	"	17	1,955
"	35	"	95	"	12	420
"	42	"	100	"	18	190

FIELD PLOTS OF POTATOES.

As the experimental plots of field roots and fodder corn do not occupy the whole of the field in which they are placed, the remaining space is usually filled with potatoes, such varieties being grown as will be of service in the annual distribution of samples from this Farm. The area devoted to the different varieties varies considerably. The past season most of the plots were from one to one and a half acres in area.

Gold Coin and Rochester Rose were planted from the 6th to the 12th of May. The remaining varieties were put in from June 3 to June 5. The potatoes were harvested from October 7 to 13.

The yield per acre (of sound potatoes only) is expressed in pounds and also in 'bushels' of 60 pounds.

FIELD PLOTS OF POTATOES.

Number.	Variety.	Time of Maturing.	Colour.	Yield per Acre.	Yield per Acre.	
				Lbs.	Bush.	Lbs.
1	Carman No. 1	Mid-season to late	White	23,930	398	50
2	Rochester Rose	Very early	Pink	23,088	384	48
3	Money Maker	Medium	White	21,689	361	29
4	Gold Coin	Mid-season to late	"	19,614	326	54
5	Irish Cobbler	Early	"	15,814	263	34
6	Emigrant	"	Pink	14,350	239	10
7	Dooley	Mid-season to late	White	7,474	124	34

REPORT OF THE CHEMIST.

FRANK T. SHUTT, M.A., F.I.C., F.C.S., F.R.S.C.

OTTAWA, April 1, 1910.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-third annual report of the Chemical Division of the Experimental Farms.

The past year has seen a very considerable increase in the work of this Division as regards analyses in connection with investigations carried on at the various Experimental Farms, in the examination of samples of an agricultural nature sent in by farmers and in the matter of correspondence. In view of this and the further fact that the staff has recently suffered through the resignation of two of the assistant chemists, many of the researches in hand could not be completed in time for insertion in this report, which, therefore, it must be understood, presents but a part of the work of the year. The more important investigations, however, that had reached a satisfactory stage for reporting, together with certain matters, the publication of which could not well be deferred, have been treated in the following pages.

Wheat and Flour.—The investigation commenced some years ago to ascertain the influence of environment on the composition of wheat has been continued and certain very striking results obtained. The experiments described were conducted on irrigated and non-irrigated lands at Lethbridge, Alta. With the same seed sown on both areas the product from the latter was the richer in protein by 4·39 per cent. The evidence, therefore, is strongly in accord with that of previous seasons, in showing that the gluten-content of wheat is markedly affected by the abundance or otherwise of moisture present in the soil during the development of the grain.

A study has been made of the composition of wheat straw from the flowering stage of the plant to that of ripeness. The results are of interest in throwing light upon certain points in the nutrition of the wheat plant and in affording information respecting the feeding value of straw cut at various stages of growth.

A preliminary study on the character of bleached flour has been made and data obtained upon the following important points:—(a) the amount of nitrite-reacting material in freshly bleached flour; (b) the moisture, ash and fat content of bleached flour; (c) the influence of bleaching on the nitrogen compounds of flour; (d) the presence of nitrite nitrogen in bread from bleached and unbleached flour; (e) the water absorptive capacity of bleached and unbleached flour; (f) the action of light and air as bleaching agents, and (g) the absorption of nitrite nitrogen by flour when exposed to the atmosphere.

Flax.—The analysis of twenty samples of flax, representing as many distinct strains, grown on the Experimental Farms in 1909, has been made. The data show

that marked differences in oil and protein content exist. There seems a strong probability that flax seed upon the market is by no means uniform in composition.

Inoculation for Legumes.—Pot and plot trials have been made during the season of 1909 with Hiltner's Nitragin as prepared by the Dr. Reiche Nitragin Company, Milwaukee, Wis., U.S.A., employing cultures for Red Clover, Alfalfa and Peas. Though the soil used was not one that had borne a leguminous crop for a number of years—at least nine—no marked advantage, speaking generally, followed the use of the cultures. This is perhaps explained by the presence of the nitrogen-assimilating organisms, as made evident by the fact that the roots of the plants in the uninoculated soil were found to be plentifully supplied with nodules.

Field Roots.—As for a number of years past, the nutritive value of the different varieties of mangels, turnips and carrots, as grown on the Experimental Farm, Ottawa, has been determined. The investigation is of interest, in addition to its main purpose, in bringing out the influence of season upon the composition of the roots.

Heredity as a factor in determining the composition of mangels has again been investigated, using the well known varieties Gate Post and Giant Yellow Globe. The season of 1909 is the tenth that this research has been prosecuted.

Sugar Beets for Factory Purposes.—The three leading varieties—Vilmorin's Improved, Klein Wanzleben and Trés Riche—as grown on the Dominion Experimental Farms, have again been submitted to analysis. On the whole, the results are most satisfactory, indicating that beets of a high sugar content and possessing an excellent degree of purity can be grown at widely distant points in the Dominion. The season was a favourable one for this crop at nearly all the Experimental Farms.

The Moisture-content of Packed and Unpacked Soils.—In this preliminary examination we have endeavoured to ascertain the value of subsurface packing as a means of conserving moisture. The experiments were conducted on areas at the Experimental Farm, Lacombe, northern Alberta. The results, though not to be considered as of a conclusive character, have not shown any material benefit from the use of the subsurface packer.

The Fertilizing Value of Rain and Snow.—The third year's work in this investigation is now reported. Seventy-five samples of rain and thirty-six of snow have been analysed. The total amount of nitrogen furnished per acre for the twelve months ending February 28, 1910, is 6·87 pounds and stands practically midway between the amounts recorded for the two previous years.

Well Waters from Farm Homesteads.—During the year 79 samples of water have been submitted to complete sanitary chemical analysis. Of these 31 have been reported as wholesome and safe for drinking purposes; 11 as seriously polluted and entirely unfit for domestic use; 26 as suspicious and probably dangerous, and 11 as saline. This branch of our work continues to be a popular one with the agricultural public and is undoubtedly of much service in procuring good water on the Canadian farm homestead.

Samples received for Examination.—A classified list of the samples received for examination during the past year is presented in the following table:—

SAMPLES Received for Examination and Report for the Twelve Months ended March 31, 1910.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	66	27	28	9	25	47	3	12	6	223	75
Mucks, muds and marls	1	1	....	....	2	1	2	6	9	22	7
Manures and fertilizers	6	....	1	2	10	18	4	13	....	54	6
Forage plants and fodders	10	16	5	9	98	22	2	5	2	169	27
Well waters	8	8	11	6	171	22	4	5	3	238	......
Miscellaneous including dairy products, fungicides and insecticides	11	6	10	8	149	29	4	12	3	232	39
Totals	102	58	55	34	455	139	19	53	23	938	154

While every effort is made to furnish information respecting the samples of a purely agricultural nature, we wish to advise our readers that it does not come within our province to analyse and report upon samples of commercial fertilizers. Correspondents desiring such analyses should communicate with the Inland Revenue Department, Ottawa. Nor can we undertake the assays or analyses of minerals and mineral waters. Questions relating to minerals may be addressed to the Department of Mines, Ottawa. And, lastly, we cannot make any analysis the results of which we do not consider of general value to the agricultural public. Examination in connection with suspected poisoning cases of animals is not undertaken.

Meat Inspection Division, Health of Animals Branch, Department of Agriculture.—Continuing this work a very considerable number of samples, consisting chiefly of preservatives, dye stuffs, spices and condiments and pickling solutions and compounds used in the packing house business, have been examined and reported upon. The chemical and microscopical work upon these samples has been with the view of determining their nature and purity.

Soils.—The most important work in soil analysis during the past year has been the completion of an investigation commenced a number of years ago respecting the nature and composition of certain typical prairie soils from northwestern Canada. It has been thought desirable to present these results with the practical conclusions drawn therefrom in bulletin form. The bulletin has gone to press and will shortly be available for distribution.

Papers Read before Scientific Societies.—The following are the titles of papers prepared and presented during the past year:—

'The Influence of Environment on the Composition of Wheat' (*Society of Chemical Industry*).

'Flour, the Relation of Composition to Bread-making Value' (*Seventh International Congress of Applied Chemistry*).

'Some Characteristics of Western Prairie Soils,' and 'Chemical Work on Canadian Wheat and Flour' (*British Association for the Advancement of Science*).

The Staff—Acknowledgments.—Reference has already been made to the resignation of two of the staff. Mr. H. W. Charlton, B.A.Sc., had been with us since 1899, and for a number of years past had had charge more particularly of the nitrogen

determinations and water analysis. During his term of office he proved himself an efficient analyst and one who performed the duties assigned to him with faithfulness and accuracy. In the resignation of Mr. A. G. Spencer, M.Sc., who was appointed in June, 1907, we lost a chemist of ability and one whose industry and skill in investigations had very considerably assisted in the work of the Division. It was with much regret that his resignation, made in order to accept a more lucrative position, was received.

Miss Olive Robertson has continued to discharge the clerical duties of the Division to our satisfaction and has earned our thanks for the painstaking and excellent manner in which her work has been performed.

The important post of First Assistant Chemist has been held for the past twelve years by Mr. A. T. Charron, M.A., who, in addition to the general charge of the laboratory work, has rendered most valuable assistance in the preparation of the annual report and other publications of the Division. Reference must also be made to Mr. Charron's assistance in connection with the large French correspondence of the Division and to the courses of lectures annually given by him on agricultural subjects in Quebec and other French-speaking parts of the Dominion. My hearty thanks are due him for much excellent help in the conduct of the work of the Chemical Division of the Dominion Experimental Farms.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

WHEAT.

THE COMPOSITION OF THE GRAIN AS INFLUENCED BY THE SOIL MOISTURE-CONTENT.

In the prosecution of this study, we began in 1908 a series of experiments on the Experimental Farm at Lethbridge in southern Alberta, a so-called semi-arid district, to learn the influence of irrigation on the nitrogen (gluten) content of wheat. We had already noticed from our investigation in the Valley River district, northern Manitoba, that the moisture-content of the soil during the development of the kernel had a marked effect on the gluten-content of the grain. An abundance of moisture tended to the production of a plumper, more starchy grain than when the supply was merely sufficient to bring the grain to maturity. The experiments on irrigated and non-irrigated land in 1908, already referred to, showed that Red Fife on the former contained 2·67 per cent less protein than that on the drier soil; similarly with Kharkov we obtained a difference in protein-content of approximately 1·0 per cent.

The repetition of this work during the past season, 1909, has afforded results of a still more marked character, as will be seen from the following statement:—

	Protein (Nx5·7) p.c.
Red Fife.—Parent seed, grown on non-irrigated land, 1908..	13·97
" Grown on irrigated land..	11·74
" Grown on non-irrigated land..	16·13

The difference in protein-content here observed between the wheats grown on irrigated and on non-irrigated soils, 4·39 per cent, is phenomenally large and, being in the same direction as previous results, assuredly supports, in a very emphatic manner, our contention that the amount of available moisture during the filling out of the grain affects its composition.

It is interesting to note, in passing, that the produce of the parent seed which had been grown in 1908, a somewhat wetter season than 1909, showed, on non-irrigated land, an improvement as regards protein-content in the drier season—an increase of 2·16 per cent—and a deterioration, if such it may be called, of 2·23 per cent when grown on irrigated soil.

The moisture-content of the two areas, irrigated and non-irrigated, was determined from time to time during the period when the greater development of the grain must have taken place, but we are of the opinion that more frequent collections would have yielded more conclusive results as regards the amounts of moisture available to the crops.

MOISTURE in Irrigated and Non-irrigated Soils.
(Samples collected to a depth of 14 inches).

Date of Collection. (Samples collected to a depth of 14 inches).	Irrigated.	Non-irrigated.
	p.c.	p.c.
July 16, 1909	9·62	8·50
August 1, 1909..................	8·19	6·20
" 25, 1909..................	8·16	5·99

One irrigation only was made, on July 10.

It is significant that during the above mentioned period the irrigated land lost 1·46 per cent moisture and the non-irrigated lost 2·51 per cent. Further, that while at the first collection the non-irrigated land was approximately only 1 per cent drier, it was at the time of the last collection 2·17 per cent drier than the irrigated soil. These differences expressed in percentages may appear small, but when it is remembered

that the weight of an acre of soil to a depth of 14 inches will be in the neighbourhood of 3,500,000 lbs., it follows that the apparently insignificant difference of 1 per cent becomes of moment, as it is equivalent to about 17·5 tons more water per acre available for the crop's needs.

In concluding this chapter, it is perhaps only right to state that the higher protein-content wheat, while the more valuable for mixing with soft wheats, may not necessarily yield the better flour for bread making, and, further, the yield of wheat is, as a rule, considerably higher on irrigated that an non-irrigated areas.

WHEAT STRAW AT DIFFERENT STAGES OF GROWTH.

In connection with our work on the chemistry of wheat and flour, and more particularly in relation to the investigation on the influence of environment on the composition of the grain, it was considered desirable to make a study of the composition as regards nitrogen compounds of the straw of the wheat plant at different stages from the flowering period to that of dead ripeness.

Through the kindness of the Cerealist, a portion of a large plot of the spring wheat Bishop, a cross-bred variety produced on the Central Experimental Farm, was placed at our disposal for the purpose of this investigation. In the collection of the samples the plants were cut 4 inches from the ground and the heads were immediately removed in order to prevent migration of the nutrients from the straw. In all, seven cuttings were made, the first being on July 9, 1909, when the plants were in flower, and the last on August 24, when the grain was dead ripe.

In the tabulated statement of data the following information is given: Date of collection, stage of growth when sample was taken, the proportional weights of heads and straw, the percentage of dry matter and the percentage of total and albuminoid nitrogen present in the dry matter, from which the proportion of total nitrogen in the form of albuminoid has been calculated.

Composition of Wheat Straw at Different Stages of Growth.

Laboratory No.	Date of Collection.	Designation of Sample.	In Fresh Material.					In water-free Substance.		
						Nitrogen.		Nitrogen.		
			Heads.	Straw.	Dry matter.	Total.	Albuminoid.	Total.	Albuminoid.	Proportion in form of albuminoids.
	1909		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
7043	July 9	In flower.	14·4	85·6	23·36	·404	·327	1·73	1·40	80·9
7058	" 16	Very early milk stage..........	19·7	80·3	26·87	·398	·313	1·48	1·16	78·3
7073	" 26	Kernel formed; 'Dough stage'.	32·4	67·6	34·37	·399	·313	1·16	·91	78·4
7082	Aug. 3	Kernel plump; 'Late dough stage' Straw about half yellow............	41·7	58·3	39·19	·364	·294	·93	·75	80·6
7096	" 9	Ripe for harvest; Straw completely yellow.....	47·3	52·7	51·30	·277	·241	·54	·47	87·0
7111	" 14	Very ripe........	53·7	46·3	80·81	·389	·347	·48	·43	89·5
7134	" 24	Dead ripe........	58·4	41·6	85·82	·395	·335	·46	·39	84·8

Considering first the proportional weights of heads and straw, we observe that the weight of the heads increases from the beginning to the close of the collection period. The largest increase in this weight occurred between the 'early milk' and the 'dough' stages, and the next largest between the latter and the 'late dough' stage, when the kernel was quite plump. The increases in proportional weight of the heads during the latter portion of the collection period are to be attributed more especially, we may presume, to the rapid drying out of the straw.

Coming now to the purpose of the investigation proper, namely, the changes in the composition of the straw during growth and ripening, the dry matter will be seen to increase from the earliest stage of the collection, when the plant was in flower, until the grain was dead ripe. While it is impossible to say definitely at what condition of the plant feeding ceases, there can be little doubt but that the acquisition of nourishment from the soil and air must proceed until some short time after the straw begins to turn yellow; and, further, that after the straw has become completely yellow, functional activity in this direction must cease. On this assumption, therefore, the increases in the dry matter of the straw noted until, say, August 9, must largely be due to the storing up of dry matter by the plant, and that after that date the apparent increase would be mainly owing to desiccation.

The total nitrogen in the fresh straw remains practically constant until the kernel has reached the dough stage. It then declines somewhat rapidly until the grain is ready for harvesting. From this on, there is a marked increase until the grain is dead ripe. Since the percentage of dry matter in the straw increases, and, as we have seen, the percentage of nitrogen remains practically constant until the 'dough' stage of the kernel, it follows that there must be during this period a constant acquisition of nitrogen by the plant. The falling off of the nitrogen in the fresh straw apparent later, would be an indication that the migration of nitrogenous compounds to the kernel is greater than the income, or, put in other words, the grain is making a draft on the store of already accumulated nitrogen. The increase after the grain is ripe is undoubtedly due to desiccation.

Considering the total nitrogen-content of the water-free substance, a steady decrease is to be noticed until the grain is ready for harvesting, after which it remains practically constant. From these facts, it might be argued either that the material migrating to the kernel is richer in nitrogen than that being elaborated by the plant, or that the latter becomes less and less nitrogenous as maturity approaches. The constancy of the nitrogen-content of the dry matter of the straw after the grain is ripe would indicate that migration had ceased or that the material being transferred to the kernel is of the same composition as that already in the plant. The former is in all probability the correct explanation, as at this period the straw must be practically functionally dead.

The study of the character of the nitrogen-compounds in the straw, as the plant proceeds from the flowering stage to that of complete maturity, is one of the most interesting features of this investigation. Until the late dough stage, the proportion of albuminoid to non-albuminoid nitrogen remains fairly constant. When this period has been reached and the grain begins to mature, there is a sudden, though not very large, increase in the proportion found as albuminoids. In these facts we have a strong indication of the constancy in composition of the nitrogenous material of the dry matter during, at all events, the earlier period of the grain's development, when the straw is in full functional activity. Subsequently, and as the straw loses vitality, which is indicated by it turning yellow, there is apparently a more or less rapid conversion into the albuminoid form. However, it is possible to account for this rise in the proportion of albuminoid nitrogen by the migration of soluble (non-albuminoid) nitrogen to the kernel at a time when acquisition of nitrogen has practically ceased.

From the standpoint of the farmer who wishes to know what may be the feeding value of wheat straw cut at one or other of the final stages of the grain's development,

this investigation shows that while the dry matter of the straw becomes poorer and poorer in nitrogenous compounds (both albuminoid and non-albuminoid) as the grain develops, the total amount of such nitrogen in the straw does not materially alter, by reason of the ever-increasing storage in the straw of dry matter. The practical conclusion from this is that straw cut before the grain is fully ripe differs in feeding value from that cut later, chiefly by reason of its greater digestibility rather than from the presence of any larger proportion of the more valuable nutrients. Ton for ton, undoubtedly the earlier cut straw is the more nutritious fodder, not as some suppose by the possession of a larger percentage of albuminoids, but from the greater availability of its constituents for the nourishment of the animal.

BLEACHED FLOUR.

The widespread interest in the United States at the present time in bleached flour as a wholesome article of food, pointed to the desirability of obtaining data respecting the influence of the bleaching agent commercially used—nitrogen peroxide—on the flour and the resultant bread. Consequently, in conjunction with the Cerealist, whose results will be found in his current report, a preliminary study has been made comprising the chemical and physical examinations of bleached flours and their breads.

In the first place a series of six flours, four of which had been milled in the Farm's experimental roller mill, were bleached under the supervision of the Cerealist. These, together with samples of the same flours unbleached, were submitted to examination in the laboratory, the following determinations being made: Moisture, total nitrogen, gliadin nitrogen, wet and dry gluten, the nitrogen in nitrite-reacting material and, in certain instances, the ash and the fat.

In every instance the bleached flour was the lighter in colour.

EFFECT OF BLEACHING ON THE COMPOSITION OF FLOUR.*

Laboratory No.	Description.	Moisture.	Ash.	Fat.	Total Nitrogen.	Gliadin Nitrogen.	Gluten. Wet.	Gluten. Dry.	Gluten. Physical Characters. Resiliency.	Gluten. Physical Characters. Elasticity.	Gluten. Physical Characters. Colour.	Nitrite-reacting material as nitrogen.
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.				p.p.m.
7484	Spring Wheat Flour, commercial, bleached.....	11·10	·38	1·01	2·06	·91	33·46	12·05	Good...	Fair....	Good..........	·90
7485	" " " unbleached...	11·38	·38	1·01	2·07	·94	32·63	12·01	" ...	" ...	"	·40
7486	Winter Wheat Flour, commercial, bleached.....	10·98	·49	1·19	1·65	·69	30·88	11·08	Fair....	" ...	"	.25
7487	" " " unbleached...	11·48	·50	1·16	1·62	·68	30·96	10·95	" ...	" ...	"	.09
7488	Yellow Cross Flour, bleached..................	9·58	....	....	2·18	·97	43·09	16·46	Good...	Good...	"	·20
7489	" " unbleached..............	10 54	....	....	2·14	·94	43·65	16·78	" ...	" ...	"	None.
7490	Kubanka Flour, bleached.....	9·81	....	....	2·25	·95	43·66	16·77	" ...	" ...	Slightly yellow.	Trace.
7491	" " unbleached.................	10·46	....	....	2·23	·89	43·74	16·66	" ...	" ...	"	None.
7492	Ebert Flour, bleached	9·77	....	....	2·27	1·13	43·81	16·55	" ...	" ...	"	·15
7493	" unbleached.........................	10·54	....	....	2·25	1·09	43·48	16·28	" ...	" ...	"	None.
7494	Red Fife Flour, bleached	9·78	....	....	2·32	1·03	44·21	16·59	" ...	" ...	Good..........	·15
7495	" " unbleached......................	10·48	....	....	2·34	1·03	46·15	16·75	" ...	" ...	"	None.

* All bleached flours employed in this investigation were bleached at our special request for this research.

Moisture.—In every instance the bleached sample was the drier, the average difference in moisture-content being ·66 per cent. All these flours, except the two commercial samples, had been kept for sometime previous to the treatment (the middle of December) in paper bags under ordinary indoor conditions. The treated flours were at once rebagged and the analyses made about two weeks after bleaching. We may, therefore, safely conclude that the lower percentage of moisture in the bleached flour is to be attributed to the treatment.

From subsequent work it would appear that the differences here noted are considerably larger than those ordinarily found between bleached and unbleached samples of the same flour when examined very shortly after treatment. It is, however, true that the bleached samples have invariably proved the drier, compared with untreated flour from the same stock.

The data referred to are as follows:—

MOISTURE-CONTENT of Bleached and Unbleached Flour.

Flour.	Moisture
	per cent.
Laboratory No. 7572 S. B., bleached	12·60
" 7571 " unbleached	12·75
" 7570 R. H., bleached	12·71
" 7569 " unbleached	12·88
" 7621 F. F. bleached	13·19
" 7620 " unbleached	13·20
" 7623 P. F., bleached	12·36
" 7622 " unbleached	12·47
" 7625 B. F., bleached	11·96
" 7624 " unbleached	12·01

Ash.—As we expected, the bleaching process did not affect the ash-content. Two flours were analysed in this regard, and the bleached and unbleached of each yielded identical results.

Later in the investigation some further data on this point were obtained and these, as will be evident from the subjoined figures, confirm the above finding.

ASH-CONTENT of Bleached and Unbleached Flour.

Flour.	Ash
	per cent.
Laboratory No. 7570 R. H., bleached	0·38
" 7569 " unbleached	0·38
" 7572 S. B., bleached	0·64
" 7571 " unbleached	0·62

Fat.—The determination of fat was made on two pairs of flours only. The figures obtained show that the bleaching process does not appreciably affect the percentage of this constituent. It was observed, however, that the extracted fat of the bleached flour was invariably paler than that of the corresponding untreated flour.

Total and Gliadin Nitrogen.—The most careful scrutiny of these data does not disclose that there has been any influence on the nitrogen compounds by the bleaching

agent. Throughout the series the results of each pair (bleached and unbleached) are extremely close, certainly the differences are such as might be ascribed to experimental error.

Wet and Dry Gluten.—These physical determinations yielded nothing of diagnostic value, unless the paler colour of the gluten from the bleached flour could be so considered. Not only were the amount of wet and dry gluten appreciably the same for the unbleached and bleached samples of flour, but no differences could be discerned in their resiliency and elasticity.

Nitrogen in Nitrite-reacting Material.—The bleaching of the flours used in this research was effected by the Alsop process, in which air containing nitrogen peroxide is the bleaching agent. An outline of the operation is as follows: A current of air is made to pass between rotatory electrodes emitting flaming discharges. This so-called electrified air is conducted into a drum or agitator through which the flour is passed in such a manner as to bring it into intimate contact with the bleaching agent. The flour in passing through the agitator occupies from 8 to 15 seconds.

The determination of nitrite nitrogen was made by the Griess-Ilosvay method, a test of extreme delicacy. It is stated to permit of the detection of 'one part of nitrite-reacting substance in one thousand million parts of the material.' As some confusion has arisen among chemists in respect to the manner of stating results, it may be well to say that in this investigation the data from this method have been calculated to *nitrogen* and express the amounts of nitrogen present in nitrite-reacting material, in parts per million of flour. The nitrite-reacting material expressed as nitrogen, ranged in the six bleached flours of the series from traces to ·9 parts per million. It is interesting to note that in five of the six cases the quantity did not exceed ·25 p.p.m.

Later in the investigation, five other samples of bleached flour were examined and the nitrite nitrogen found ranged from traces to ·45 p.p.m. The data are as follows:—

Nitrite Nitrogen in Bleached Flours.

Flour.	Nitrite-reacting material as Nitrogen.
	p. p. m.
Laboratory No. 7570 R. H	Trace.
" " 7572 S. B	·15
" " 7621 F. F	·20
" " 7623 P. F	·45
" " 7625 B. F	·44

Summarizing this feature of the work, ten of the eleven bleached flours contained less than ·5 p.p.m. nitrite nitrogen.

The analysis of all these samples was made within three weeks of the bleaching process, so that these results should indicate the amounts present in freshly, or practically freshly, treated flour.

Coming now to the question of nitrite nitrogen in unbleached flour, the data of the first series show that no trace of nitrite-reacting material was detected in four of the six samples submitted to examination. In the other two, Laboratory Nos. 7485 and 7487, ·4 and ·09 p.p.m. were found respectively. These two samples were obtained from flours that had been kept several days unprotected in the room where bleaching was being carried on and, further, were packed in the same box when being shipped to Ottawa. To ascertain if the presence of the nitrite nitrogen noted in these two flours was the result of absorption from the atmosphere of the bleaching room or

possibly from the close association with bleached samples in transit, it was decided to obtain and submit to examination a series of flours bought on the open market, respecting which we had the assurance that they had not been subjected to the bleaching process, and, secondly, a series collected and immediately bottled from the stream of flour as it entered the agitator of the Alsop apparatus. If these flours were found to give the nitrite reaction, then it might be held that unbleached flours might normally contain nitrite-reacting material. If, on the other hand, no such action were obtained it might be concluded that the two flours, Nos. 7485 and 7487, had absorbed their nitrite nitrogen from the atmosphere of the bleaching room or of the box containing the bleached samples. As will be seen from the following data none gave the nitrite reaction.

NITRITE Nitrogen in Unbleached Flours.

Flour.	Nitrite-reacting material as Nitrogen.
Series 1. Commercial.	p. p. m.
Laboratory No 7553 R. H	None.
" 7554 G	"
" 7555 M. R	"
" 7556 S. B	"
Series 2. Special.	
Laboratory No. 7569 R. H	None.
" 7571 S. B	"
" 7620 F. F	"
" 7622 P. F	"
" 7624 B. G	"

It will thus be observed that omitting the two samples Nos. 7485 and 7487, respecting which it has been stated that there was a strong probability of their obtaining nitrite nitrogen accidentally, not a single sample of unbleached flour gave any reaction.

BREAD FROM BLEACHED AND UNBLEACHED FLOURS.

Since the consumption of flour is chiefly in the form of bread, it becomes a question of very considerable interest to learn whether bread from bleached flour contains an appreciable amount of nitrites. The process of bread making in its latter stages is such, we might suppose, as would tend to a certain dissipation of the bleaching agent, provided the bread in baking were not exposed to the products of combustion. On the other hand, it would seem possible that in bread from unbleached flour, free from nitrites, in the operation of bread making there might be produced or absorbed sufficient nitrites to give the reaction. In the results of the experiments about to be detailed, we have information of a definite character on these two questions.

The baking was under the supervision of the Cerealist, and was accomplished in an electric oven. The fermentation was of comparatively short duration—the quantity of yeast being somewhat larger than that employed ordinarily—and the baking temperature high, which implies a short baking period. The loaves were necessarily of small size.

Bleached and unbleached flours, from certain of the samples already discussed, were used in this work. With respect to the unbleached, the commercial flours Nos. 7485 and 7487, which we have seen contained a certain amount of nitrites due to ex-

posure in the bleaching room, were baked. Bread was also baked from one sample of unbleached flour, free from nitrites. Four different samples of bleached flours containing varying amounts of nitrites, completed the series.

BREAD from Bleached and Unbleached Flours.

Laboratory No.	Designation.	Nitrite-reacting material as nitrogen.	
		In flour.	In bread.
		p. p. m.	p. p. m.
7484	Spring wheat flour, bleached	0·9	0·109
7484	" " " "	0·9	0·15
7485	" " " unbleached	0·4	None.
7486	Winter wheat flour, bleached	0·25	"
7487	" " " unbleached	0·09	"
7488	Yellow Cross flour, bleached	0·20	0·07
7490	Kubanka flour, "	Trace.	None.
7491	" unbleached	None.	"

The two commercial samples, Nos. 7485 and 7487, containing, though unbleached, ·4 and ·09 p.p.m. nitrite nitrogen respectively, furnished bread perfectly free from appreciable amounts of nitrites. This shows that even considerable amounts of nitrites may be entirely dissipated in the process of baking. The other sample of unbleached flour, No. 7491, contained no nitrites and its bread was similarly free.

Considering the bleached flours, we find that the sample No. 7484, containing ·9 p.p.m. nitrite nitrogen, yielded bread possessing ·109 p.p.m. on the first baking and ·15 on the second. This shows that, when the bleaching agent is present in a flour in considerable quantities, it may not be entirely discharged in bread making. No. 7486, a bleached flour containing ·25 p.p.m. nitrite nitrogen, gave bread with no nitrite reaction. The same is true of bread No. 7490, a bleached flour containing traces of nitrite. The bread of No. 7488, a flour which possessed ·20 p.p.m., was found to have retained ·07 p.p.m.

From these results we may conclude that flour free from nitrite-reacting material baked in an electric oven will yield bread free from nitrites. And, secondly, that flour containing considerable amounts of nitrite nitrogen if similarly baked, the bread therefrom may or may not be free, but in any case the amount will be very considerably reduced.

WATER ABSORPTIVE CAPACITY OF BLEACHED AND UNBLEACHED FLOURS.

In discussing the moisture-content in the flours employed in this investigation (page 198) it was pointed out that the bleached samples were invariably the drier. This fact, together with the statement made by some that bleached flour compared with unbleached from the same stock will produce the greater weight of bread, led us to inquire if bleaching affected temporarily or permanently the capacity of the flour to absorb moisture from the atmosphere.

Two flours were used, one from a spring wheat, the other from a winter variety. Portions of each were bleached, and consequently the series tested consisted of four samples. These were exposed in duplicate in a thin layer on large 'watch glasses' to the atmosphere of the laboratory from January 12 to February 8, 1910. Weighings were made at several intervals during this period and the changes noted. Since in all cases the duplicates gave closely concordant results, the averages only have been inserted in the table.

EFFECT of Exposure on Moisture-Content of Bleached and Unbleached Flours.

Laboratory No.	Designation.	Percentage of Moisture.					
		Initial 12.1.10	One day 13.1.10	Two days 14.1.10	Six days 18.1.10	Twenty-one days 2.2.10	Twenty-seven days 8.2.10
7484	Spring—Bleached...........	11·10	7·65	6·88	7·64	7·66	6·49
7485	" Unbleached..........	11·38	7·03	6·27	6·98	6·99	5·75
7486	Winter—Bleached	10·98	7·38	6·63	7·27	7·26	6·14
7487	" Unbleached..........	11·48	6·93	6·12	6·78	6·80	5·55

In considering these results, it will be interesting to note the general temperature and humidity of the atmosphere on the dates of weighing. Very cold and dry weather prevailed on the 12th, 13th and 14th. On January 18 it was damp and mild. It was mild and dry on February 2 and very cold and dry on the 8th.

The moisture-content of both bleached and unbleached samples is seen to fall off very rapidly; one day's exposure to the dry air resulting in a loss varying from 3·5 per cent to 4·5 per cent. A second day's exposure still further reduced the percentage of moisture, the additional loss varying from ·75 per cent to ·81 per cent. The change to a milder and less dry atmosphere resulted in a slight increase in the moisture-content on the 18th, the gain being from ·64 per cent to ·86 per cent, making the data almost identical with those of the 13th. The results of February 2 are practically the same as those of January 18—the mild and comparatively dry weather of February 2 having apparently no further influence on the moisture-content of the flour. On February 8, when it was very dry and cold, the flours again lost moisture, the amounts varying from 1·12 per cent to 1·25 per cent.

These results prove that the moisture-content of both bleached and unbleached flours, when similarly exposed, vary directly with the hygroscopic condition of the atmosphere.

Contrasting the bleached with the unbleached flour, the former, at the outset of the experiment, was in both instances the drier. It is significant to note that at each of the five subsequent weighings, the bleached flour contained more moisture than its companion (untreated) sample, which would indicate that any influence of the bleaching as regards the reduction of the moisture-content is only temporary. It would further seem that the bleaching agent so affects the flour that it loses less moisture under similar atmospheric conditions than the same flour untreated.

Immediately following the foregoing experiment (February 8), the 'watch glasses' containing the flours were placed over a vessel of water under a large bell jar and consequently were exposed to a saturated atmosphere. This was done in order to ascertain the relative absorptive capacity of the bleached and unbleached samples. Weighings were made on February 19 and 21, the following average results being obtained:—

EFFECT of Exposure to Saturated Atmosphere on Moisture-Content of Bleached and Unbleached Flours.

Laboratory No.	Designation.	Percentage of Moisture. Initial 8.2.10	Eleven days 19.2.10	Thirteen days 21.2.10
7484	Spring—Bleached	6·49	19·87	19 86
7485	" Unbleached	5·75	19·07	19·07
7486	Winter—Bleached	6 14	19·38	19·25
7487	" Unbleached	5·55	19 12	19·19

The deduction from these data is that, exposed to a saturated atmosphere, the bleached flour absorbs a somewhat larger amount of moisture.

Considering, therefore, that bleached flour was found slightly drier and its absorptive capacity somewhat greater than unbleached flour, our results give some support to the contention that a slightly larger amount of bread could be obtained from the former.

LIGHT AND AIR AS BLEACHING AGENTS.

Certain experiments of a preliminary nature have been made with the view of learning the influence on flour of sunlight and air, separately and together, as bleaching agents.

Experiment I.—Portions of unbleached flour, No. 7622 (which had been shown to be free from nitrites) were placed between clean glass plates, the layer of flour being about ¼ of an inch thick. The plates were bound together at the edges with gummed paper, so that there was no free access of air to the flour. One pair of plates was completely covered with black paper to exclude the light. Both pairs were exposed in bright sunlight, the temperature of the air being considerably below the freezing point. The first examination of the samples was made at the end of one hour, when it was found that the flour exposed to the sunlight was distinctly paler than that covered with black paper. This bleaching effect of sunlight was still more marked at the end of the second and third hours of exposure. As the only air present was that imprisoned between the flour particles, we have in the results of this experiment direct evidence of the bleaching action of sunlight.

Experiment II.—Portions of the same flour weighing about 30 grammes were spread on large 'watch glasses' (diameter 4 inches) and exposed to the air; (a) in direct sunlight, and (b) in comparative darkness. The sample submitted to the influence of air and light (a) was placed under a large glass funnel, so arranged that air could freely circulate over the surface of the flour. In order to protect the other sample, (b), from light the 'watch glass' containing the flour was placed under an inverted brass sieve, the arrangement allowing free passage of the air, but excluding light. The flour exposed to light and air (a) bleached rapidly; that in air, protected from light was similarly affected, but the bleaching was very much less pronounced. There seems no doubt, therefore that air in the absence of direct sunlight exercises a bleaching influence.

To determine if flour bleached by exposure to air and light had taken up nitrite-reacting material from the air, the two samples, (a) and (b), were examined at the close of the experiment by the Griess-Ilosvay method. Both samples were found to contain nitrite nitrogen to the extent of ·05 p.p.m.

FLAX SEED.

As is probably well known, flax seed is generally characterized by large percentages of protein and oil and consequently is a grain possessing a high nutritive value. Though this is true, considerable differences in composition (especially as regards oil-content) are known to exist and flax seed upon the market is by no means uniform. In his work with flax the Cerealist, therefore, undertook to produce a number of strains of fixed character by propagation from single selected plants. Recognizing that the values of flax seed must depend to a large extent on the richness of the seed, he deemed it desirable to have analyses made of the best from among these strains before further carrying on his studies of them in the field. Twenty samples, representing as many distinct strains, grown on the Experimental Farm, Ottawa, in 1909, were therefore submitted to analysis, the determinations made being oil, protein and weight of 1,000 kernels.

FLAX, 1909.

Laboratory No.	Name.	Oil.	Protein (N x 6·25)	Weight of 1000 Kernels.
		%	%	Grammes.
7766	White Flowering A	36·80	19·06	5·1588
7767	" " B	37·85	23·75	4·7324
7768	Common A	34·50	27·56	4·4928
7769	" B	35·77	26·69	4·4420
7770	" C	34·62	24·19	4·2454
7771	" D	35·64	24·00	3·9044
7772	" R	35·28	27·37	4·3328
7773	" S	36·01	27·00	4·1556
7774	Yellow Seed A	38·16	25·75	4·3224
7775	" " B	37·02	26·25	4·2390
7776	" " C	38·26	25·31	4·5012
7777	La Plata A	42·20	20·25	8·8538
7778	" B	39·76	21·31	7·9780
7779	" C	40·82	21·94	5·9750
7780	Russian A	35·74	26·06	4·3646
7781	" B	35·35	27·43	4·3850
7782	Riga A	36·25	25·81	4·2542
7783	" B	36·70	27·25	4·5422
7784	" C	35·35	25·25	3·9122
7785	Novarossick B	39·94	22·12	5·5110
	Average	37·10	24·77	4·9151

Oil.—The percentage of oil varies from 34·50 to 42·20, while the average of the series is 37·10.

Considerable differences between strains from the same variety are to be noticed, amounting in some cases to as much as 1·5 per cent. Examples of strains differing markedly from one another in oil-content are to be found in almost every variety under examination. The three strains of La Plata stand first in the series as regards oil-content.

Protein.—The percentage of protein varies from 19·06 to 27·56, the average for the series being 24·77.

As with the oil, but in a still more marked degree, differences between closely related strains occur. Thus in one instance (Nos 7766 and 7767) the difference in protein is more than 4 per cent.

A study of the data shows that while there is a relationship between the oil and protein content no constant ratio exists. In a general way, however, the tendency is for the protein to vary inversely as the oil.

The datum 'weight of 1,000 kernels' varies greatly, the extremes in the present series being 3·9044 grms. and 8·8538 grms. The average for 20 samples is 4·9151 grammes.

Attention may be directed to the results for La Plata A and B (Nos. 7777 and 7778), which are very considerably higher than the figures obtained for the other samples. They are associated with a particularly large and plump seed.

An attempt at correlation of these data with those for the oil and protein does not reveal any relationship. It was, however, very evident on inspection of the samples that the weight varied with the size—the larger the seed the heavier the weight per 1,000 kernels.

INOCULATION EXPERIMENTS WITH NITRAGIN FOR LEGUMES.

Experiments with specially prepared cultures for the growth of legumes were commenced by us in the spring of 1897 and have been continued, almost uninterruptedly, since that date. During this period the merits of almost every culture upon the market have been studied and reported on.

In the spring of 1909, trials were begun with Hiltner's Nitragin as prepared by the Dr. Reiche Nitragin Company, of Milwaukee, Wis., U.S.A., cultures being used for Red Clover, Alfalfa and Pease. The methods of both seed and soil inoculation were followed, the series comprising trials in pots and plots.

RED CLOVER—Pot Experiment.

Date of sowing, May 19th ; Date of first cutting, Aug. 27th ; Date of second cutting, Oct. 10th.	Uninoculated.	Seed inoculated.	Soil inoculated.
	Grammes.	Grammes.	Grammes.
First cutting, green	97·3	109·7	125·9
Second " "	73·9	69·3	104·4
Total " "	171·2	179·0	230·3

The soil used in the pot series was an extremely light, sandy loam, taken from the area devoted to the plot experiments and which had not carried a legume crop for many years. Its nitrogen content was ·101 per cent.

At the date of the first cutting there was no appreciable difference in appearance, but, as the above data show, the growth from the inoculated crops was heavier than that from the untreated. When cut the second time, there was similarly but little difference in appearance between the pots. In considering the total weight, the yields from the uninoculated and seed inoculated pots were seen to be very close—the difference is not sufficient to indicate any material advantage from the use of the culture. With the soil inoculated, however, the yield was markedly higher than from the untreated pots, the increase presumably being due to the use of the culture.

RED CLOVER.—PLOT EXPERIMENT.

The 'catch' of clover on all the plots from the first seeding, May 19, was owing to the dry weather that prevailed, very poor. It was, therefore, decided to reseed, which was done on June 19. At the close of the season the growth was very irregular on all the clover plots, and it was consequently thought undesirable to record the relative yields. These plots were left for experimentation during the season of 1910.

ALFALFA—Pot Experiment.

Date of sowing, May 19; date of first cutting, August 27; date of second cutting, October 13.	Un-inoculated.	Seed inoculated.	Soil inoculated.
	Grammes.	Grammes.	Grammes.
First cutting, green	58·4	55·1	55·0
Second cutting, green	69·2	63·5	71·8
Total	127·6	118·6	126·8

Though no great differences were to be remarked between the pots at the date of the first cutting, the plants in the uninoculated pots appeared somewhat the healthiest. The total yields do not indicate any benefit from the use of the culture.

ALFALFA—Plot Experiment.

Date of sowing, May 19; date of first cutting, August 3; date of second cutting, Sept. 29	Uninoculated.				Seed inoculated.				Soil inoculated.			
	Fresh.		Air dried.		Fresh.		Air dried.		Fresh.		Air dried.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
First cutting	10	3	2	6	4	12	1	3	11	3	2	11
Second cutting	18	9	4	13	14	10	3	12	17	2	4	10
Total	28	12	7	3	19	6	4	15	28	5	7	5

The three plots constituting the series were each 8′ x 12′. The seeding was at the rate of 25 lbs. per acre.

The yields from the uninoculated and the soil inoculated plots are practically identical, that from the seed inoculated area being decidedly less. It is interesting to note that the results from the pots and plots correspond and consequently confirm one another.

The plots, as in the case of the clover, have been left for trial during 1910, to learn the effect of the culture on the second year's growth.

PEAS—Pot Experiment.

Date of sowing, May 19; date of cutting, July 30.	Un-inoculated.	Seed inoculated.	Soil inoculated.
No. of plants	17	16	17
No. of pods	47	42	36
	Grammes.	Grammes.	Grammes.
Weight of plants, green	180·7	192·4	149·1
Weight of pods, green	98·5	72·4	74·2
Total weight	279·2	264·8	223·3
Weight of plants, air-dried	46·6	53·1	38·3
Weight of pods, air-dried	17·0	12·2	11·1
Total weight	63·6	65·3	49·4

When cut, July 30, the uninoculated and seed inoculated pots were very similar in appearance and were decidedly superior to the soil inoculated pot, a deduction confirmed by the yields taken either green or air-dried. It is evident, therefore, that no beneficial effect resulted from the employment of the culture.

PEAS—Plot Experiment.

The plots used for the peas adjoined those of the alfalfa and clover series and were similar to them in size. The seeding was at the rate of 3 bushels per acre. The variety was Golden Vine.

YIELD from Inoculated and Untreated Plots.

Date of sowing, May 19; date of cutting, August 3.	Yield.			
	Fresh crop.		Air-dried crop.	
	Lbs.	Oz.	Lbs.	Oz.
Uninoculated	54	12	13	13
Seed inoculated	46	1	12	6
Soil inoculated	49	10	12	4

The largest yield, weighed either green or cured, was from the untreated plot, indicating that on this soil at least there is no advantage in inoculation. That inoculation is unnecessary is borne out by the results of our examination of the roots of the alfalfa and peas. In both number and size the nodules on the roots of the plants from the uninoculated plots did not fall behind those of the plants which had been inoculated. Our experience, from trials covering a very considerable period, leads us to believe that special inoculation is not generally necessary in eastern Ontario. This is probably also true for the most cultivated districts of eastern Canada, though certain isolated instances in which apparently considerable benefit had followed inoculation are not unknown to us.

On a tour through several of the larger agricultural areas of British Columbia, made a few years ago, the writer took especial care to obtain information respecting the growth of clover and other legumes. The luxuriant crops of alfalfa and of various clovers that were to be observed alike on the coast and on the irrigated soils of the semi-dry belt furnished convincing evidence that inoculation could not be generally necessary in that province. Moreover, in further support of this statement, it may be said that nodules containing the nitrogen-assimilating bacteria were found on the roots of every legume examined. The most noticeable benefit from inoculation has been in the northwestern provinces, a striking example of which at Lacombe, Alta., was recorded in our report for 1909. In this instance the inoculating material was surface soil taken from a field growing alfalfa on the Experimental Farm at Lethbridge, Alta., the application being made at the rate of 300 lbs. per acre. This method of inoculation with soil has of all methods proved the most effective and successful and is to be recommended in preference to the employment of cultures, where inoculation is thought necessary or desirable.

In conclusion, we may point out that failure to obtain a catch of clover or other legume does not necessarily imply the absence of the nitrogen-assimilating bacteria; it more often is due to deficiency of moisture, an unsuitable seed bed, an acid condition of the soil or to a lack of proper drainage. Seed of a low germinative value has also been found answerable for an imperfect catch. Before concluding that inoculation is necessary it would therefore be the part of wisdom to enquire if the lack of success may not be due to one or more of these unfavourable conditions, or to poor seed.

THE RELATIVE VALUE OF FIELD ROOTS.

With the view of obtaining some knowledge respecting the relative feeding values of the leading varieties of field roots, we began in 1904 the analysis of the mangels, turnips, carrots, &c., as grown on the Central Experimental Farm, Ottawa. The present report, therefore, gives the results of the sixth season's work.

MANGELS.

The fourteen varieties of mangels grown during the season of 1909 were submitted to analysis. The names of some of these varieties appear here for the first time, but it is not at all improbable that several of these apparently new sorts have been grown and reported on under other names. The practice of certain seed growers and vendors in putting on the market well-established varieties under new names causes considerable difficulty in such an investigation as this, in which it has been sought to ascertain among other things the influence of heredity on the composition of the root.

Though in the following list it is possible that some three or four are new varieties, or more correctly speaking new strains, by far the larger number have long been known to our farmers.

The determinations made comprise dry matter, sugar in juice and weight of root, the two former being considered a measure of the feeding value. The varieties are arranged in the subjoined table in the order of their dry-matter content.

ANALYSIS of Mangels, Central Experimental Farm, Ottawa, Ont., 1909.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lbs.	Oz.
Giant Sugar	87·34	12·66	7·40	2	9
Prize Mammoth Long Red	87·40	12·60	7·56	2	8
Giant White Feeding Beet	87·61	12·39	6·92	3	7
Gate Post	88·18	11·82	6·64	3	14
Yellow Intermediate	88·40	11·60	6·14	2	15
Crimson Champion	88·64	11·36	6·71	4	8
Selected Yellow Globe	88·65	11·35	6·47	2	7
Half Sugar White	88·74	11·26	5·82	3	8
Giant Yellow Intermediate	88·79	11·21	7·32	2	5
Perfection Mammoth	88·96	11·04	5·04	4	5
Giant Yellow Globe	89·05	10·95	5·82	3	7
Giant Yellow Intermediate	89·32	10·68	5·22	3	11
Mammoth Red Intermediate	90·91	9·09	5·39	3	8
Our Ideal	91·06	8·94	4·47	3	9

Though in this table the varieties follow one another fairly closely in their dry-matter and sugar-content, it will be noticed that the differences that exist between the richest and the poorest of these roots are very considerable; thus we find between the first and the last members of the series a difference equivalent to 29 per cent of the dry matter and 39 per cent of the sugar present. These facts are in accord with our previous findings and serve to demonstrate the advisability of considering the composition as well as yield and keeping quality in the selection of a variety.

The figures representing the average composition of the mangels for the past six years are of considerable interest, first in showing that the roots of the past season come very close in dry matter and sugar to the average of the six years, and, secondly, that when the investigation includes a number of practically the same varieties, average figures are obtained that do not vary greatly from year to year.

MANGELS—Average Composition, 1904-1909.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Dry Matter.	Sugar.
		Lbs.	Oz.	p. c.	p. c.
1904	10	2	11	11·69	6·62
1905	17	3	19	10·04	4·67
1906	16	2	7	11·63	5·93
1907	10	2	11	12·64	7·46
1908	12	2	2	11·87	5·33
1909	14	3	5	11·21	6·21
Average for six years 1904-9	.....	.....		11·51	6·03

In addition to the influence of heredity upon the composition of roots—a matter we shall discuss briefly in a subsequent paragraph—the size of the root is a potent

factor in determining the dry matter and sugar-content. Thus, in 1905, the average weight was the highest in the series and the percentages of dry matter and sugar the lowest. As the character of the season is undoubtedly one of the chief factors regulating size, the influence of season on composition is obvious.

INFLUENCE OF HEREDITY IN MANGELS.

We have already remarked upon the effect of size and season on composition and alluded to heredity as a further factor influencing the feeding value of roots. In order to learn to what degree characteristics of composition in mangels may be attributed to heredity, we selected ten years ago two well known and distinct varieties—Gate Post and Giant Yellow Globe—which at that time appeared to represent the extremes of composition in this class of roots. These have been grown annually side by side since that date and analysed.

Dry Matter and Sugar in Gate Post and Giant Yellow Globe Mangels.

Seasons of Growth.	Gate Post.				Giant Yellow Globe.			
	Average Weight of One Root.		Dry Matter.	Sugar in Juice.	Average Weight of One Root.		Dry Matter.	Sugar in Juice.
	Lbs.	Oz.	p.c.	p.c.	Lbs.	Oz.	p.c.	p.c.
1900	....		11·14	6 15	....		8·19	2 64
1901	2	9	9·41	4·15	3	3	9·10	4·08
1902	3	2	13·90	9·39	3	9	10 24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1905	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12·73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
1908	1	11	12·02	4·94	2	4	10·66	4·47
1909	3	14	11·82	6·64	3	7	10·95	5·82
Average for 10 years	....		12·14	6·69	....	....	10·14	5·00

Without a single exception the Gate Post has shown itself the superior variety, both in respect to dry matter and sugar. The fact that these varieties have maintained, practically, their relative positions for ten consecutive seasons goes far towards establishing the contention that heredity plays an important part in determining the composition of the root. It would seem from these results that there is a profitable field for work in breeding rich feeding roots and that possibly as much improvement might be effected in that direction as has followed the special breeding of sugar beets for sugar production during the last twenty years.

TURNIPS.

In the season of 1909, thirteen varieties of turnips were grown on the Central Experimental Farm and analysed. Though the differences throughout the series in dry matter and sugar are not so marked as in the case of the mangels, the data afford substantial evidence that all varieties of turnips are not alike in feeding value.

ANALYSIS of Turnips, Central Experimental Farm, Ottawa, Ont., 1909.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lbs.	Ozs.
New Century	87·34	12·66	1·69	2	9
Hall's Westbury	88·14	11·86	1·47	2	2
Halewood's Bronze Top	88·29	11·71	1·51	2	15
Good Luck	88·43	11·57	1·79	2	9
Skirvings	88·52	11·48	1·28	1	15
Jumbo	88·74	11·26	1·48	3	8
Hartley's Bronze Top	88·80	11·20	1·48	2	8
Carter's Elephant	88·92	11·08	1·63	2	9
Perfection Swede	88·95	11·05	1·37	2	2
Kangaroo	89·01	10·99	0·99	3	5
Mammoth Clyde	89·20	10·80	1·26	2	4
Magnum Bonum	89·33	10·67	1·18	3	1
Bangholm Selected	89·42	10·58	1·42	2	12

The fact is apparent from these results that while the percentage of dry matter approximates that of mangels, the sugar-content of the latter is very considerably greater, and hence mangels must be regarded as superior in feeding properties.

The averages for the past five years are subjoined and indicate that the roots of the past season were of an average quality.

TURNIPS.—Average Composition, 1905-1909.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Dry Matter.	Sugar.
		Lbs.	Ozs.	p.c.	p.c.
1905	20	2	13	10·09	1·10
1906	20	1	10	12·18	1·78
1907	14	3	5	10·14	1·11
1908	13	3	12	9·87	1·52
1909	13	2	10	11·30	1·43

CARROTS.

Six varieties were grown and analysed, five of which are the same as those reported on last year. As hitherto noticed, there is a closer approximation in composition among carrots than is found in mangels. Nevertheless, in conjunction with other features, such as yield and keeping quality, the question of variety is worthy of some consideration.

ANALYSIS of Carrots, Central Experimental Farm, Ottawa, Ont.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lbs.	Ozs.
Half Long Chantenay	88·44	11·56	3·36	0	10
Ontario Champion	89·17	10·83	3·19	1	0
White Belgian	89·63	10·37	2·06	0	15
Mammoth White Intermediate	89·90	10·10	2·08	1	1
Mammoth Intermediate	90·00	10·00	1·75	1	2
Improved Short White	90·46	9·54	1·38	1	4

The table of averages serves to emphasize what has been noted in past reports—a remarkable uniformity in the composition of carrots when practically the same varieties are included from year to year in the investigation. We might, therefore, deduce that seasonal influences did not affect carrots in the same degree as other field roots and especially mangels.

CARROTS.—Average Composition, 1905-1909.

Year.	Number of Varieties Analysed	Average Weight of One Root.		Dry Matter.	Sugar.
		Lbs.	Ozs.	p.c.	p.c.
1905	11	1	3	10·25	2·52
1906	10	1	2	10·59	3 36
1907	6	1	1	10·30	3·02
1908	6	1	3	10·89	3·34
1909	6	1	0	10·40	2 30

SUGAR BEETS FOR FACTORY PURPOSES.

In accordance with our custom for many years past we have again submitted to analysis the leading varieties of factory beets—Vilmorin's Improved, Klein Wanzleben and Trés Riche—as grown on the several Experimental Farms.

SUGAR Beets Grown on the Dominion Experimental Farms, 1909.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of One Root.		Yield per Acre.	
					Lbs.	Ozs.	Tons.	Lbs.
Vilmorin's improved	Nappan, N.S	17·52	19·83	88·3	0	15	12	1,575
"	Ottawa, Ont	13·43	16·20	82·9	1	10	15	1,600
"	Brandon, Man	17·89	22·37	79·9	1	8	19	1,336
"	Indian Head, Sask	17·25	19·89	86·7	1	9	14	248
"	Lethbridge, Alta, irrigated	18 59	20·24	91·8	1	8	24	510
"	" " non-irrigated	17·05	19·69	86·6	1	3	11	1,760
"	Lacombe, Alta	13·16	19·17	68·6	0	12	5	296
"	Agassiz, B.C	18·28	19·63	93·1	1	3	12	420
Klein Wanzleben	Nappan, N.S	16·63	18·67	89·0	0	14	13	1,225
"	Ottawa, Ont	16·48	17·91	92 0	1	4	14	1,900
"	Brandon, Man	17·33	21·17	81·8	1	7	12	1,976
"	Indian Head, Sask	16·94	19·69	86·0	1	7	15	624
"	Lethbridge, Alta, irrigated	17·74	19·49	91·5	1	8	24	1,500
"	" " non-irrigated	17·44	20·29	85·9	1	4	6	1,860
"	" " irrigated (Raymond Seed)	17·68	19·69	89·7	1	10	18	630
"	Lethbridge, Alta, non-irrigated (Raymond Seed)	21·17	23·49	90·1	0	14	4	1,900
"	Lacombe, Alta	11·83	15·43	76·7	0	13	4	1,768
"	Agassiz, B.C	17·80	19 43	91 6	1	1	12	288
Très Riche	Nappan, N.S	16·05	17·97	89·3	1	1	14	875
"	Ottawa, Ont	14·62	16·37	89·3	1	15	15	1,000
"	Brandon, Man	21·26	24·76	85·8	1	3	13	1,192
"	Indian Head, Sask	17·28	20·03	85·1	1	5	13	1,558
"	Lethbridge, Alta, irrigated	17·64	19·17	92·0	1	3	24	510
"	" " non-irrigated	17·78	20 23	87·8	0	14	9	810
"	Lacombe, Alta	13·33	16·47	80·9	0	11	4	448
"	Agassiz, B.C	18·83	20·89	90·1	1	3	8	424

With one or two exceptions, the sugar-content and 'purity' data are exceedingly satisfactory. On the larger number of the Farms, and more particularly at Brandon and Indian Head, the season appears to have been more than usually favourable for large yields of rich roots, a sufficiency of rain during the earlier months being followed by a dry, warm autumn.

We have again to record very poor results, both as to quality and yield, from Lacombe, Northern Alberta. A very late spring and generally 'dry' season militated against good returns from all root crops at this Farm.

For the second season, sugar beets from irrigated and non-irrigated areas on the Experimental Farm at Lethbridge, Southern Alberta, have been examined. The results are extremely interesting. Comparing beets grown under 'dry farming' methods with those provided artificially with water, we find that in two cases only out of the four the non-irrigated beets are the richer, and in one instance only is the difference at all significant. This in the main is in accord with the results of the previous season (1908) and does not lend any substantial support to the contention that the irrigated crop would be the poorer in sugar.

The 'purity' of the beets from both irrigated and non-irrigated plots is extremely satisfactory, the former having slightly the advantage.

The yields from the irrigated areas are from two to four times those from the corresponding non-irrigated plots, and it is a matter of much satisfaction to note that this very large increase has not been obtained at the expense of quality.

Averages from the three varieties for the past eight seasons are presented in the following table . They allow us to compare the sugar-content of these beets, season by season, as grown at widely distant points in the Dominion.

AVERAGE Percentage of Sugar in Juice in Sugar Beets Grown on Experimental Farms, 1902-1909.

Locality.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Nappan, N. S.	15·87	15·33	14·41	16·52	17·08	....	17·53	16·74
Ottawa, Ont.	16·77	15·34	16·91	12·45	14·37	15·44	16·30	14·84
Brandon, Man.	....	11·36	16·62	11·09	15·50	16·99	15·82	18·83
Indian Head, Sask.	15·15	16·54	15·24	14·94	14·91	15·92	15·66	17·16
Lethbridge, Alta.—irrigated	....	....	....	....	....	....	16·09	17·91
" " non-irrigated	....	....	....	....	....	....	16·73	18·36
Lacombe, Alta.	....	....	....	....	....	13·34	11·21	12·77
Agassiz, B. C.	....	17·44	8·10	17·32	14·23	17·65	17·15	18·30

That the season of 1909 has been a very favourable one at nearly all the Experimental Farms will be apparent on comparing the data of the last column of the above table with those obtained for the preceding years. The figures indicate, in almost every instance, a very superior root for factory purposes.

THE MOISTURE-CONTENT OF PACKED AND UNPACKED SOILS.

The importance of sub-surface packing for the conservation of moisture has been greatly emphasized in connection with soil culture in semi-arid districts.* This packing is, presumably, the distinguishing feature of the much heralded system of 'dry-farming,' an unfortunate term, by the way, since it leads the uninitiated to suppose that equally successful crops may be grown with less moisture than in humid regions, which of course is not the case. The effect of the smaller amount of water furnished the soil in districts of sparse precipitation is counter-balanced in 'dry-farming' by special methods of culture which result in the conservation of moisture. These comprise the preparation by deep ploughing of a thick layer of soil which, by reason of its improved texture, is capable of holding much moisture. The ploughed land is at once 'packed,' for which purpose a special implement is employed. The general form of machine known as a 'sub-surface packer' resembles a disc harrow, the wheels or discs of which have bevelled rims. The object of the operation is to 'firm the lower part of the furrow slice and leave the surface loose.' In this way capillarity is re-established and the stores of moisture in the subsoil are made more readily available for the growing crops. Cultivation with a tooth harrow immediately follows the packing in order to prepare a 'dry earth mulch.' This has the effect of checking evaporation. Cultivation is repeated after every rain throughout the season, or at all events as often as is deemed requisite to prevent the caking of the surface soil and to keep the land free from weeds.

To ascertain what additional amounts of water might be brought up by packing and stored in the surface soil, determinations have been made during the past season of the moisture in the soil to a depth of 14 inches in areas packed and not packed, but otherwise similarly treated and cultivated on the Experimental Farms at Lethbridge and Lacombe, Alta.

The data from the packed and unpacked areas in summer-fallow at Lethbridge are as follows:—

Moisture-content of Soils—Packed and Unpacked—Experimental Farm, Lethbridge, Alta.

Date.	Percentage of Moisture.	
	Packed.	Unpacked.
July 16, 1909	13·55	13·35
August 21, 1909	13·68	12·36
October 1, 1909	11·21	11·22
November 2, 1909	11·13	10·21

The first samples were collected immediately after the fallow had been prepared, and, as may be seen from the data, the moisture-content was the same for both areas. Five weeks later, when the second series of samples were taken, the packed soil was the richer in moisture by approximately 1·3 per cent. The third series, collected on October 1 were identical as to water-content, but on November 2, when the last samples were forwarded, the packed soil contained nearly 1·0 per cent more moisture.

* Summer-fallowing as a means of conserving moisture and keeping the land free from weeds was first practised by Mr. Angus Mackay, Superintendent of the Experimental Farm, Indian Head, Sask., and has been widely adopted for the past twenty years in the wheat-growing areas of the Canadian Northwest. The immense value of fallowing as a means of storing up moisture for the crop of the succeeding year was shown by determinations of the soil-moisture in fallowed and stubble lands in 1900, the data appearing in the report of the Chemist for that year.

The treatment of the land at Lacombe from which the samples were taken may be described as follows: The land carried a barley crop in 1908 and was ploughed in the fall of the same season. Part of the fall-ploughed land was immediately sub-surface packed. No cultivation was given in the spring of 1909 previous to the taking of the first samples. After these were collected, both areas were harrowed and seeded with barley. Those plots packed in the fall of 1908 were again packed after the barley was sown and no further cultivation given to either plot.

MOISTURE-CONTENT of Soils, Packed and Unpacked—Experimental Farm, Lacombe, Alta.

Date.	Percentage of Moisture.	
	Packed.	Unpacked.
May 14, 1909	11·93	11·55
August 23, 1909	7·59	7·48

The difference in moisture-content at the date of the first collection (May 14) was less than ·5 per cent, the packed soil being the more moist. On August 23, when the barley was harvested, the differences was still less, though such as it was showed that the packed soil had the advantage.

It is not claimed that this preliminary examination furnishes data of a conclusive character—it will be necessary to repeat the work under different seasonal conditions, probably determining the soil-moisture more frequently—but it is significant that this year's results show no very great advantage from the use of the sub-surface packer.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The analysis of the rain and snow as falling at Ottawa was begun in the early months of 1907, and has been continued since that time. We are, therefore, now able to present data for the third year's work in this investigation.

The determinations comprise free and albuminoid ammonia and nitrogen in nitrates and nitrites, and from the results so obtained and the monthly precipitation data, the amounts of organic and saline nitrogen furnished per acre per annum are calculated.

Rain and Snow at Ottawa for the Year ending February 28, 1910.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per Acre.
	Rain.	Snow.	Total in Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites	Total.	
1909.				p.p.m.	p.p.m.	p.p.m.	p p.m.	
March	1·38	24·00	3·78	·301	·107	·177	·585	·501
April	2·96	7·50	3·71	·245	·457	·585	1·287	1·082
May	5·84	....	5·84	·507	·102	·300	·909	1·203
June	2·53	....	2·52	·494	·127	·366	·987	·564
July	4·69	....	4·69	·374	·072	·198	·644	·684
August	3·11	....	3·11	·490	·103	·209	·802	·565
September	2·81	....	2·81	·397	·101	·301	·799	·508
October	1·11	....	1·11	·973	·091	·065	1·129	·284
November	2·93	2·50	3·18	·332	·122	·548	1·002	·722
December	....	15·00	1·50	·175	·070	·053	·298	·101
1910.								
January	1·36	9·50	2·31	·307	·108	·112	·527	·276
February	·08	22·25	2·30	·335	·108	·284	·727	·379
Total for 12 months	28·79	80·75	36·86	....	....	....	....	6·869

During the year ending February 28, 1910, 75 samples of rain and 36 of snow were analysed.

The total precipitation for the year was 36·86 inches, slightly more than two inches above the average (34·78 inches) for the past 19 years. Of this precipitation, 28·79 inches fell as rain and 8·07 inches as snow. By reason of the rainfall being somewhat larger and the snowfall considerably less than usual, the proportion of the total fall as rain during the past year was higher than the average.

There was no season of drought and reference to the data shows that the precipitation was very fairly distributed throughout the summer months. The total amount of nitrogen furnished per acre for the 12 months ending February 28, 1910, stands practically midway between the amounts recorded for the two previous years, as will be apparent from the following tabulated statement.

—	Rain in inches.	Snow in inches.	Total precipitation in inches.	Pounds of Nitrogen per Acre.
Year ending, February 28, 1908	24·05	133·0	37·35	4·323
" " 28, 1909	22·99	96·25	32·63	8·364
" " 28, 1910	28·79	80·75	36·87	6·869
Average for 19 years	25·52	92·56	34·78	

As stated in our last report*, we surmised that the amount of nitrogen found for the year ending February 28, 1909, was abnormally high, owing to the prevalence of bush fires during the late summer and autumn months of 1908 in the Ottawa valley and neighbouring districts, resulting in the atmosphere being heavily charged with smoke. No such fires occurred during the past summer. It was also pointed out that a further disturbing factor of the summer of 1908 was the high winds that prevailed from time to time in periods of drought. Such winds naturally fill the atmosphere with light particles of soil and organic debris which are washed out by the rain, increasing the nitrogen-content of the latter. As during the summer of 1909, in this district, there were practically no such dry periods, with high winds, the data for the past year represents more accurately the amounts of the nitrogen compounds normally present in the rain and snow. Of the total amount of nitrogen furnished per acre, 6·87 lbs., approximately 4·46 lbs. or 65 per cent occurred as free and organic ammonia and 2·41 lbs. or 35 per cent as nitrates and nitrites.

AVERAGE Nitrogen-Content of Rain and Snow—Amount of Nitrogen per Acre, as Free and Albuminoid Ammonia and as Nitrates and Nitrites.

—	Number of samples analysed.	Precipitation in inches.	Nitrogen.								
			Parts per Million.				Percentage of Total.			Per Acre.	
			In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
										Lbs.	Lbs.
Rain	75	28·79	·429	·148	319	·894	48	17	35	3·79	2·04
Snow	36	80·75	·269	·097	·203	·569	47	17	36	·67	·37

* Report of the Chemist, 1909, page 191.

The nitrogen furnished by the rain was 5·83 lbs. or approximately 85 per cent of the whole; that by the snow was 1·04 lbs. or about 15 per cent.

The greater richness of the rain in nitrogen compounds is again evident, though the difference between the rain and snow in this regard is not so marked as in the previous season, which, as we have stated, was undoubtedly abnormal. Our three years' work, therefore, shows that, both relatively and absolutely, rain furnishes more nitrogen to the soil than snow.

The proport·on or distribution of the nitrogen compounds is very similar to that of the two previous years. In both rain and snow the averages of the year show that the proportion of nitrogen as free ammonia is the largest and that as albuminoid ammonia the smallest. The figures in columns 8, 9 and 10 of the table are remarkable in showing that, when averages are taken for the season, the percentages of the total nitrogen present as 'free ammonia,' 'albuminoid ammonia' and as 'nitrates and nitrites' are the same for both rain and snow.

THE WATER SUPPLY OF FARM HOMESTEADS.

From the outset the Experimental Farm system has sought to impress on Canadian farmers the very great importance of an abundant supply of good, pure water on the farm homestead, and has further made very clear the dangers involved in using water from a polluted source. This has been educational rather than research work, but for this reason it has been none the less valuable in the years that have gone by. Looking back over the past twenty-three years it might perhaps be difficult to find any branch of the work of this Division that has been of more practical and immediate benefit to our farmers than has been this matter of water analysis, and the reporting on locations for the site of the farm well and related subjects. Over 2,000 samples of water from rural homes have been analysed in the Experimental Farm laboratories, and every sample has been reported upon fully to the sender, the data being accompanied by a pronouncement upon the nature and quality of the water, the character of the pollution when such has been found present, and the possibility of improving the supply if such be necessary.

Over the larger part of the Dominion it is by no means a difficult matter to obtain a good supply, i.e., a wholesome water in sufficient abundance for house and stock use. There is probably no better watered country in the world than Canada—either from the standpoint of quantity or quality. The waters of the innumerable lakes, streams and springs with which the Dominion abounds are naturally of the purest, and the same may be said in even more emphatic language as regards the underground, deep-seated waters, to which we must look for our farm supply in the larger number of instances. It is only in those districts in northwestern Canada characterized by a sparse precipitation, or where what might be termed semi-arid conditions prevail, that the obtaining of a desirable supply may become a matter of anxiety and great difficulty. In such regions potable water is frequently scarce and means of purification, as by distillation, must be resorted to in order to obtain a supply free from saline matter.

On the larger number of farms, therefore, in the older provinces of the Dominion, a supply of good water is not an impossibility, though in obtaining it and piping it to the house and farm buildings there will be, of course, some expenditure, varying with the circumstances. It is against the barnyard and back-door well that we again utter an emphatic protest. The water in such may remain good for a few years after the homestead is established, but sooner or later the soil surrounding such wells must become saturated and clogged with organic filth and unable to perform its useful work of purification. It is thus, more frequently than by the inflow of purely surface washing, that manurial matter finds its way into the well. Fully 90 per cent of the polluted waters reported on by us are from shallow wells situated as we have described, and not a few of them have been proved to be veritable cesspits. The drilled or bored well, tapping a deep source, located at a safe distance from possible sources of pollution and effectively protected from the entrance of surface wash, is undoubtedly what we should advise on the majority of farms; it might be depended on to furnish, in the larger number of cases, an ample supply of good, wholesome water.

Of the 79 waters reported on in the appended tabulated data, 31 have been returned as wholesome, 26 as suspicious, 11 as seriously contaminated, and 11 as saline.

ANALYSES OF WELL WATERS, 1909-10.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
1	Almonte, Ont	B.R., No. 1	Apl. 16	·155	·300	·514	2·0	117·6	63·2	54·4	Free	Suspicious.
2	"	B.R., No. 2	" 16	·610	·235	·708	1·5	120·8	63·2	57·6	V. h. traces.	Safe and wholesome.
3	Dunrobin, Ont	H.E.R.	May 6	·05	·16	4·83	120·0	484·8	332·0	152·8	Trace	Polluted.
4	Calgary, Alta	J.S.D.	" 10	·16	·06	·115	17·5	1132·0	980·0	152·0		Free from pollution.
5	Aylmer, Que	M.A.L.	" 10	·02	·11	·939	4·0	234·4	174·4	60·0	Trace	Safe and wholesome.
6	Miscouche, P.E.I.	R.G	" 11	Free.	·09	7·07	80·0	326·4	244·8	81·6	Free.	Contaminated.
7	Westboro, Ont	J.K.	" 21	·11	·40	25·5	40·0	750·4	490·4	260·0	Trace	"
8	Sault au Recollet, Que	P.P.J.	" 22	·10	·21	18·92	57·0	620·0	493·2	126·8	L. traces	Seriously contaminated.
9	Vermilion, Alta	A.B., No. 1	" 28	·12	·20	·13	2·5	558·4	408·0	150·4	"	Decidedly suspicious.
10	"	" No. 2	" 28	Free.	·25	Free.	3·0	386·4	228·0	158·4	Trace	Excellent, wholesome.
11	Vernon, B.C.	A.V	June 2	"	·04	·065	7·0	916·0	712·8	203·2	V. sl. traces.	Free from pollution.
12	Antigonish, N.S.	J.R.C.	" 2	·12	·08	Free.	100·0	2442·0	1908·0	534·0	Free.	Seriously contaminated.
13	Ottawa, Ont.	C.E.F.	" 8	·01	·23	·107	20·8	94·0	73·2	20·8		
14	Fenelon Falls, Ont	W.B., No. 1	" 11	Free.	·165	11·06	22·0	464·8	401·2	63·6	Trace	Decidedly suspicious.
15	"	" No. 2	" 11	·77	·09	·123	29·0	407·2	256·0	151·2	"	" "
16	Cypress River, Man.	W.N.S.	" 21	Free.	·14	Free.	28·0	2411·0	2005·0	406·0	"	Free from organic pollution.
17	Grondines, Que	E.H.G.	" 24	"	·09	2·47	22·0	258·8	204·4	54·4	"	Decidedly suspicious.
18	Woodroffe, Ont	J.M.R.	July 2	"	·02	3·78	4·0	278·0	219·6	68·4	Free.	Suspicious.
19	Nepean Tp., Ont	A.T.S.	" 7	"	·06	·28	7·0	224·0	168·0	56·0	"	Free from contamination.
20	Oak Bay, N.B.	A.C.M.	" 22	·42	·135	1·55	70·0	339·6	263·6	76·0	Trace	Dangerously polluted.
21	Ayers Cliff, Que	H.J.L.	" 27	Free.	Free.	2·02	6·0	237·6	192·0	45·6	"	Excellent water.
22	Aylmer, Que	F.G.W.	" 27	·06	·02	·065	12·0	408·8	252·8	156·0	None.	Suspicions.
23	Woodroffe, Ont.	J.M.R.	" 29	·02	·04	5·28	7·0	326·0	211·6	115·2	L. traces	"
24	Folger Station, Ont.	A.T.S.	Aug. 9	Free.	·13	·181	4·0	240·8	166·4	74·4	S. traces	Safe and wholesome.
25	Massawippi, Que	K. & H., No. 1	" 9	·55	·22	·068	3·0	140·0	84·8	55·2	Trace	Free from contamination.
26	" "	" No. 2	" 9	·21	·18	Free.	Free.	241·2	167·2	74·0	"	" "
27	Hilliar, Ont.	S.N	" 10	Free.	·25	"	180·0	1219·2	887·6	331·6	"	Polluted.
28	Ottawa, Ont.	J.F.A.	" 10	·06	·36	·777	50·0	353·6	225·2	130·4	L. traces	Highly suspicious.
29	Dunham, Que	N.L.W	" 12	Free.	·030	·411	15·0	286·0	214·8	71·2	"	Contaminated.
30	Bridge End, Ont	P.D. McD.	" 17	·05	·16	·321	28·0	187·2	118·4	68·8	Free.	Suspicious.
31	Arnprior, Ont	C.N.	" 19	Free.	·28	·005	1·75	80·9	39·6	41·2	"	Wholesome.
32	Lemieux, Que	A.L., No. 1	" 21	"	·42	Free.	10·0	254·4	174·4	80·0	"	"
33	"	" No. 2	" 21	"	·435	"	67·0	570·0	406·0	164·0	"	"
34	"	" No. 3	" 21	"	·30	1·06	47·0	328·0	219·0	109·0	"	"
35	"	" No. 4	" 21	"	·34	Free.	13·0	200·0	135·0	65·0	"	"

ANALYSES OF WELL WATERS, 1909-10—*Concluded.*

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
36	St. Hyacinthe, Que	F.E	" 26	120·0	·22	·0329	150·0	657·6	518·4	139·2	Trace	Suspicious.
37	Hampton, N.B	E.C.H	Sept. 2	·08	·10	2·46	6·0	81·6	60·0	21·6	V. sl. traces.	Highly suspicious.
38	Westmoor, Sask	H.B	" 16	4·14	·49	1·15	70·0	4226·0	3324·0	902·0	Free.	Saline.
39	Shanly, Ont	Rev. W.K.	" 17	·15	·135	·99	22·0	546·0	360·0	136·0	....	Contaminated.
40	Moncton, N.B	W.C.	" 18	·02	·06	7·59	30·0	394·0	240·0	154·0	....	Suspicious.
41	Britannia, Ont	J.M.R	" 23	Free.	·09	Free.	4·0	240·0	176·0	64·0	....	Wholesome.
42	Vernon, B.C	E.B	" 25	·16	·07	·082	1·0	516·8	474·4	42·4	V. sl. traces.	"
43	Rideau River, Ont	O.M.I.	" 27	Free.	·74	·032	8·5	120·0	75.2	44·8	"	Contaminated.
44	Ottawa East, Ont	O.M.I., No. 1	Sept. 27	Free.	·04	5·42	44·0	400·0	280·0	120·0	V. sl. traces.	Very suspicious.
45	" " "	" No. 2	" 27	1·24	·16	·89	8·0	260·0	210 4	49·6	"	Suspicious.
46	Westport, N.S	C.G.	" 27	Free.	·09	2·4	40·0	160·0	117·6	42·4	"	Very suspicious.
47	Lloydminster, Alta	W.H.H.	" 29	·14	·30	Free.	60·0	2862·0	2182·0	699·2	"	Saline.
48	Ottawa, Ont	S.M.L.Co	Oct. 14	Free.	·08	·741	Free.	134·8	103·2	31·6	"	Wholesome.
49	Elstow, Sask	J.R	" 18	1·06	·15	Free.	150·0	4308·8	3452·4	856·4	Trace.	Saline.
50	Tate, Sask	H.C.F	Nov. 1	Free.	·13	·609	43·0	2316·0	1806 4	509·6	Free.	"
51	Middle Simonds, N.B	C.R	" 26	"	Free.	·623	2·0	149·2	128·8	20·4	Trace.	Wholesome.
52	Westboro, Ont	F.W.H.J	" 26	"	·04	6·19	6·0	284·8	222·0	62·8	"	Unpolluted.
53	Sault au Recollet, Que.	M.W	" 30	"	·255	Free.	2·0	70·0	24·0	46·0	Free.	Wholesome.
54	Almonte, Ont	B.R., No. 1	Dec. 4	"	·11	·082	2·0	97·6	64·4	33·2	Trace.	Unpolluted.
55	" "	" No. 2	" 4	·07	·28	·024	5·0	124·4	66·8	59·6	"	"
56	City View, Ont	S.A., No. 1	" 17	Free.	·09	4·90	40·0	274·4	206·4	68·0	Free.	Highly suspicious.
57	" "	" No. 2	" 17	"	·11	10·32	40·0	516·8	364·0	152·8	"	" "
58	Letellier, Man	N.B	Jan. 7	·64	·18	3·85	60·0	736·0	574·4	161·6	L. traces	Contaminated.
59	Algonquin Park, Ont	J.F.A	" 7	·35	·68	Free.	1·0	38·0	12·0	26·0	V. sl. traces.	Free from drainage pollution.
60	Watford, Ont	J.D.C.	" 19	Free.	·135	1·05	11·0	338·0	284·0	54·0	Trace.	Suspicious.
61	Renfrew, Ont	E.J.McV	" 24	"	·12	Trace.	Free.	38·0	16·0	22·0	Free.	Wholesome.
62	Hoasic, Ont	R.S.W	" 31	"	·09	3·62	3·0	357·6	297·6	60·0	Trace.	"
63	Copetown, Ont	F.B.H	Feb. 2	·13	·07	6·19	45·0	530·0	366·0	164·0	"	Highly suspicious.
64	Kelowna, B.C	LeR.D	" 9	Free.	·05	Free.	2·0	139·2	70·0	69·2	"	Pure and wholesome.
65	Wadina, Sask	J.T	" 10	·06	·11	·164	14·0	1588·8	1298·8	290·0	"	Saline.
66	The Brook, Ont	A.C	" 16	8·49	·23	·42	4400·0	13517·6	7420·0	6097·6	"	"
67	Elm Creek, Man	P.D.A	" 21	1·14	·13	Free.	720·0	3384·8	2600·8	784·0	L. traces	"
68	Huntingdon, Que	R.J.S	" 25	·87	·11	3·41	37·0	533·6	398·4	135·8	Trace.	Suspicious.
69	Cummings' Bridge, Ont	C.P	Mar. 8	1·57	·78	Free.	281·0	1222·4	1117·6	104·8	"	Highly suspicious.

70	South Melfort, Sask.	J.T	"	11	·09	·20	·70	11·0	4491·2	3783·2	708·0	Free	Saline.
71	Williams Siding, B.C	Ch.G	"	12	·15	·195	·04	·6	72·0	54·2	17·8	"	Suspicious.
72	Sidney Crossing, Ont.	A.R.B.	"	19	6·60	·435	2·449	5600·0	11412·0	9416·0	1996·0	"	Saline.
73	Summerland, B.C.	S.P	"	21	·04	·25	Free.	6·0	258·4	219·2	39·2	"	Not contaminated.
74	Maniwaki, Que.	J.L., No. 1.	"	24	·010	·170	·733	2·0	113·6	86·4	27·2	"	" "
75	" "	" No. 2.	"	24	·010	·540	1·277	2·0	169·6	120·8	48·8	"	" "
76	Penticton, B.C.	E.F.B.	"	28	·240	·140	4·052	3·0	90·0	78·0	12·0	"	Suspicious.
77	Granum, Alta	A.W.D	"	28	·300	·110	2·200	115·0	2502·4	2489·6	12·8	"	"
78	Shadeland, Man	L.Bros	"	28	5·260	·460	1·696	520·0	8097·0	7751·0	346·0	"	Saline.
79	Grondines, Que.	E.H.G.	"	30	·160	·120	·962	101·0	708·8	589·6	119·2	"	Suspicious.

REPORT OF THE ENTOMOLOGIST

C. GORDON HEWITT, D.Sc.

OTTAWA, March 31, 1910.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director of the Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the report of the work of the Division of Entomology, with an account of some of the more important insects and pests that occurred in Canada, and concerning which advice was given during the year ending March 31, 1910.

The year has been one of importance and interest for these reasons: it is twenty-five years since my predecessor, the late Dr. James Fletcher, was appointed Dominion Entomologist to the Department of Agriculture, and two years later he was permanently and officially attached to the Department on the establishment of the Experimental Farms in 1887. Owing to the rapid agricultural progress and activity and his indefatigable energy, the entomological and botanical work together became far too great for the direction of a single officer. The need for further development of entomological work and investigation, and the increasing demands for advice, in addition to the increase of other duties of an administrative and executive character, necessitated the separation of the entomological and botanical work and the formation of a separate Division of Entomology. This change was effected during the present year, and, having been appointed in May to take charge of the work, I arrived in Canada on September 16, 1909. The major portion of my time during the ensuing six months has been occupied in the equipping and organizing of the work of the new Division. Three rooms have been provided, and the two larger of these have been furnished and equipped as entomological laboratory and museum respectively, and the third is occupied by me. It has been necessary to make use of a fourth room for the carrying on of breeding and other experiments, and there is a pressing need for accommodation for this work which is the most important branch of the work of the Division.

In equipping the Division, the primary object has been to provide facilities and means for the prosecution of investigatory work. The need of such work is urgent, as we are being confronted annually with fresh problems which can be elucidated only by the careful study of, not only the life-histories of insects, but also their bionomics. In Canada especially, with its varying climates, as complete a knowledge as possible of the factors affecting the lives and habits of injurious insects is a *sine qua non*. We need to know the effect of extreme cold, for example, on certain species of insects in order to be able to determine the possible distribution of such insects. A further field of investigation to which attention must be given is that of parasitism. The importance of a more thorough knowledge of the parasites affecting, not only injurious insects, but also native insects is being realized by entomologists. In many instances we are compelled to rely on such natural means of control as these parasites, belonging to different classes of insects, and also on parasitic fungi. In the work of con-

trolling the Gipsy and Brown-tail moths in the New England States, upon which more than a million dollars is being spent annually and to which the State of Massachusetts is devoting more than one-tenth of its annual budget, the chief means by which control will ultimately be established will be undoubtedly by parasites, and upon the study, importation, breeding and distribution of the different parasites of these two insects, several hundred thousand dollars are being expended each year—indicating from a monetary point of view alone the importance of this means of control. A knowledge of the relation of birds to the agriculturist and horticulturist, as regards their utility and otherwise as natural means of control of insect pests, is greatly to be desired. Owing to the absence of any accurate data of value on this subject in Canada there is a danger of the destruction, through ignorance, of species which may be useful to the farmer and fruit grower and, until such data have been collected by actual analysis of the contents of the stomachs of birds, no statements of value can be made as to the economic worth of any but purely insectivorous birds.

The work of the Division at present falls under a number of heads. The greater portion of the time of the officers is occupied in the identification of injurious and other insects sent in by correspondents in the various provinces of the Dominion, and the giving of advice as to the treatment of these pests. Whenever it is necessary or desirable the insects are studied. In addition to these investigations that are continually being made, it is intended to make a study of certain problems which are at present requiring attention. The Brown-tail Moth (*Euproctis chrysorrhœa, L*) will be studied in reference to conditions in Canada. A study of the Larch Sawfly *(Nematus erichsonii*, Hartig.), which I began in England, is being continued with especial reference to its European and American parasites. Mr. Gibson is continuing his work on the larvæ of the Noctuid moths, many of which, under the popular name of 'cutworms,' are responsible for enormous losses at times; consequently a study of the life-history and bionomics of all the forms that it is possible to obtain is of very great importance, as the possession of such knowledge is oftimes of value, inasmuch as it not infrequently happens that, when land is cultivated, species hitherto uninjurious become pests. Further experiments on the control of those injurious insects, the Root-Maggots, will be carried out. A number of other important lines of investigation, many of which are urgent, will be followed as opportunities are offered.

During the past few months a new 'Destructive Insect and Pest' Bill has been introduced. The necessity for such legislation is extremely pressing. With the rapid development of all forms of rural activity, and the importation of vegetation of all kinds from other countries, we are exposed to the grave danger of the introduction of serious insect and other pests. As examples of such introduced pests it is only necessary to refer to the San José Scale and the Brown-tail Moth, than which no more serious fruit pests occur. There was already in existence the San José Scale Act passed in 1898, with subsequent amendments, under which regulations were made for the fumigation of all nursery stock likely to be infested with the scale, and the fumigation stations at six ports of entry were established. Such regulations, providing for fumigation only, were totally inadequate to meet the requirements of present conditions, and in view of this the Hon. the Minister of Agriculture introduced the new Bill. Briefly, it provides for fumigation against the San José Scale and Woolly Aphis; the inspection of imported nursery and other stock that is liable to be infected with serious insect pests such as the Brown-tail and Gipsy Moths, and the power of inspection of orchards and other lands or premises which it may be deemed advisable to inspect for those insects and other pests scheduled as serious. On the appearance or threatened appearance of an insect pest dangerous to agriculture, horticulture or forestry, it will be possible for the Hon the Minister of Agriculture to issue such regulations as shall enable him to take the necessary precautionary or eradicative steps It also makes provisions for the granting of compensation by the Minister for vegetation, &c., destroyed in pursuance of the regulations.

The Brown-tail Moth is still the most serious entomological problem with which we have to deal. Towards the end of March I visited those districts in Nova Scotia where the insect has been established and exists at present, to gain a complete idea of the nature of the infestation. During this visit, I addressed several public meetings in the infested region and impressed the seriousness of the infestation upon the people, many of whom, owing to their ignorance as to the facts, which was only natural, had been somewhat indifferent. With the means at their disposal, the provincial authorities under Mr. M. Cummings, the Secretary of Agriculture for Nova Scotia, have carried on an excellent campaign against the insect and too much stress cannot be laid on the importance of such eradicative measures in the early stages of the infestation. In our campaign against the Brown-tail Moth we may profit by the painful experience of the State of Massachusetts. In 1890, they began exterminative work against the Gipsy Moth which had increased enormously since its introduction in 1869 and was inflicting most serious damage in the State. This work was energetically continued for ten years and by 1900 the moth had been reduced to such an extent that it was doing no serious damage and, in fact, had been exterminated in many localities. Most unfortunately, the State discontinued operations and in a few years the insect increased to such an enormous extent and spread over so wide a territory, that now, with the Brown-tail Moth, it is entailing an expenditure of over a million dollars annually. It is necessary, therefore, that every means possible should be taken to prevent the spread and obtain control of this insect in Canada or it will be impossible to estimate the financial loss and physical suffering which its presence will entail. This season the inspection of European nursery stock imported into Canada is being continued and already a large number of the winter nests of the Brown-tail Moth have been discovered on French nursery stock, but, as the inspection will continue until May, the results cannot be given in this report.

I am pleased to say that there have been no serious outbreaks of insects injurious to cereals which form the staple results of agricultural activity in Canada. White Grubs and Wireworms have caused serious damage to potato crops in certain regions and methods of combatting these are considered below. A slight spreading of the San José Scale has occurred, but it is believed and hoped that the means that the Department of Agriculture of Ontario are adopting for dealing with this insect will be effectual.

In July, a serious outbreak of the Spruce Budworm (*Tortrix fumiferana* Clemens) was investigated and reported upon by Mr. Gibson. Certain species of bark and timber boring beetles are causing much damage, especially to coniferous forest trees, and it is extremely desirable that a knowledge of these should be gained, especially on account of its important relation to the question of the conservation of our forests.

In addition to the above work, great use is made of the Division by entomologists and collectors in different parts of Canada who send in specimens and collections for identification. By means of our own collections and with the help of specialists in Canada and the United States, for whose assistance I wish to express my sincere thanks, especially to Dr. Howard, Entomologist to the United States Department of Agriculture, we are able, not only to render this useful assistance, but also to acquire knowledge which is frequently of importance to the work of the Division. The entomological collections of the Division are being arranged with a view to making them as useful as possible to the student, the teacher and also the general public. For the general public and for lecturing purposes, exhibits of typically injurious insects, their life histories and injuries are being arranged. In the absence of a national collection of Canadian insects, every endeavour is being made to render the systematic collections as complete and representative as possible.

The supervision of the orchards on the Indian reserves in British Columbia, on behalf of the Department of Indian Affairs, with a view to the eradication of the

pests occurring there, has continued, and the work of spraying, pruning and cleaning out has been carried on by Mr. Tom Wilson. It is a great pleasure to find that our efforts to inculcate better horticultural methods among the Indians are not only meeting with some success, but are also giving satisfaction to the fruit-growers and settlers who previously complained about the state of the Indian orchards.

Shortly after taking up my duties, I left Ottawa on October 3 for British Columbia to inspect the western fumigation stations and the Indian orchards, and also for the purpose of inquiry in connection with the work of the Division. The Experimental Farms at Brandon, Indian Head and Agassiz were visited, and I returned on October 26. The annual meeting of the Entomological Society of Ontario at which I delivered the public address, was attended in November, and from this meeting I went to Niagara Falls and Windsor, Ont., to inspect the fumigation stations at these points. The fumigation stations at St. John, N.B., and St. John's, Que., were inspected on November 18 and 19. On December 9 an address on 'Fruit Pests' was delivered at the annual meeting of the Pomological Society of Quebec at Macdonald College, Que. The meeting of the American Association for the Advancement of Science held at Boston during the last week of December was attended, including the meetings of the Entomological Society of America and the Association of Economic Entomologists, a paper on the Larch Sawfly being read at the latter. Addresses have also been delivered before the Commission of Conservation and also at Truro, N.S., and other places on various classes of injurious insects and their control.

I should like to take this opportunity of acknowledging the services of, and my indebtedness to, my Chief Assistant, Mr. Arthur Gibson, who carried on the work of the Division from the beginning of the year until my arrival in September, that is, for the first six months and also during my absence from Ottawa at various times. Mr. R. C. Treherne, B.S.A., is inspecting European nursery stock for the Brown-tail Moth, and Mr. J. A. Letourneau, in addition to the secretarial work which he has efficiently carried out, has begun a catalogue of the entomological publications of the library of the Division, which has been considerably increased by the purchase of the library of the late Dr. Fletcher and of a number of standard works and additional periodicals.

The work of the Division is increasing annually, but especially during the last year, owing to the measures that are being taken against the Brown-tail Moth. It is of the greatest importance, however, that the more important work of investigation should not be hindered owing to the natural increase of duties of an executive character, otherwise progress in our knowledge of the problems awaiting solution will not be made, and the work of the Division cannot attain such a scientific character as is essential, if it is to be of the greatest practical value to Canada.

I have the honour to be, sir,

Your obedient servant,

C. GORDON HEWITT,

Dominion Entomologist.

DIVISION OF ENTOMOLOGY.

Every year complaints are made concerning the injuries to field and root crops caused chiefly by two species of insects, namely, White Grubs and Wireworms. In many cases these injuries might have been prevented or reduced had the farmers and others been in possession of the following facts. White Grubs and Wireworms generally occur in old pasture or grass land. Their presence is not usually noticed unless their injuries are severe, as in the cases mentioned later. This is doubtless owing to the fact that grass land does not receive so careful scrutiny as a crop. When such land is turned down and put under cultivation, the subsequent crop is usually sown at once; not infrequently potatoes are planted, with the result that these insects, supplied with new food very much to their liking, cause considerable damage. It is necessary, therefore, for farmers to bear these facts in mind and, on putting old grass or pasture land under cultivation, to adopt such means of cultivation as are recommended in order to avoid the possibility of serious injuries to their crops by these insects, which, owing to their peculiar life histories and habits, cannot be controlled on a large scale by other means. It will be found that where a regular rotation of crops is practised and land is not left under grass for more than two or three years, White Grubs and Wireworms will be considerably less injurious, and from the point of view of crop production, such rotations are to be recommended.

During the year the White Grub has been one of the most injurious insects. This insect has been extremely plentiful, especially in the eastern provinces of the Dominion, and in every occurrence it was reported to be very injurious. In many counties in Ontario and also in Quebec and Prince Edward Island, potatoes were severely attacked; in some cases they were not worth digging and 12 to 15 grubs were to be found in a single hill. In Middlesex, Ont., grass-land was so severely attacked that the top could be rolled off perfectly dead, and one correspondent collected four quarts of the grubs, which were only about one-third of those present, in a tenth of an acre. In Ontario, Quebec and Nova Scotia they were injurious to strawberries and to corn which had been planted on the sod in Ontario.

The White Grub is the larva of a fairly large and robust brown beetle which, as it appears in these regions in June, is called the June Bug; further south they appear earlier and are known as May Beetles. These beetles, usually species of *Lachnosterna,* feed on the foliage of certain trees such as oak, maple, poplar, chestnut, &c., and are sometimes the cause of no little injury to such hardwoods. They deposit their eggs singly in the ground at a depth of one to several inches and the young white grubs or larvæ on hatching out feed on the young roots of the grass or crop which they are attacking. The approach of winter causes them to work their way deeper into the soil where they hibernate. They usually remain three seasons in the grub stage, hibernating each winter except the last, before which the grubs usually change into the pupal stage, and from this into beetles, and the mature beetles hibernate to emerge the following year. The greatest damage is done by the grubs in the second and third years of their growth when they feed on the larger roots. It should be pointed out, however, that our knowledge of these insects and their life histories is comparatively meagre. The remedial treatment are still, as a rule, in the unsatisfactory state of being suggestive.

DIAGRAM OF LIFE HISTORY OF THE WHITE GRUB. *(Lachnosterna sp.)*

1910.		1911.		1912.		1913.
Summer.	Winter.	Summer.	Winter.	Summer.	Winter.	Summer.
Eggs laid, Grubs hatch and begin to feed.	Grubs hibernate.	Grubs feed.	Grubs hibernate.	Grubs feed and change into Pupæ, from which Beetles emerge in a few weeks.	Beetles hibernate.	Beetles emerge and lay eggs.

As the White Grub passes all its life underground it is almost impossible to control it by ordinary measures. In cases where small areas of grass are attacked, drenching the affected area with kerosene emulsion is sometimes effective. Where larger areas are attacked, methods of cultivation only can be relied upon. Deep ploughing in the fall will bring up large numbers of the hibernating grubs and expose them to climatic influences such as frost, &c. If possible, this should be repeated a second year and cross-ploughing is to be recommended if the infestation is severe. Hogs or poultry turned on the ploughed land will destroy large numbers of the grubs. Such crops as cereals and roots should not be sown on infested land, but clover, which appears to be more immune, may be sown on the land and then ploughed under in the following fall. Two fall-ploughings with an intermediate crop of clover will expose and destroy very many of the White Grubs in their different stages. It is impossible on account of the prolonged life history, extending as it does over several years, to rid infested land of these insects by measures carried out for one year only; repetition is necessary to destroy those larvæ which have escaped the previous year's treatment. In Europe, the destruction of the adult beetles, which can be effected by collecting them or by spraying the infested trees with an arsenical spray has been found to be of great service in reducing the infestations.

WIREWORMS.

As in the case of White Grubs, these insects are found frequently to attack crops of cereals or roots which have been sown in permanent grass land newly turned under cultivation, owing to the fact that their normal habitat is grass land, where they live feeding on the roots. Potatoes are often sown as the first crop, and, in consequence, the majority of complaints that are received are of injuries to potatoes in the different provinces from Nova Scotia to British Columbia. In Ontario, it was the chief insect of which complaints were received as destroying new fall wheat, and in Nova Scotia it destroyed corn which had grown about two feet in height.

Many remedies have been suggested for Wireworms and much disappointment has resulted from their trial, with no little loss of time, money and faith. The wireworm is the larva of a beetle known as the 'click-beetle,' of which there are a number of species. The beetle is rather long compared with its breadth, brown in colour and has the habit, when laid on its back, of jumping into the air with a click and righting itself. The Wireworms are about an inch or an inch and a quarter long when full grown, of a light brown or brownish yellow colour and have three pair of legs at the anterior end. These characters distinguish them from the millipedes mentioned later, which are often mistakenly called Wireworms. Their life history, like that of the White Grub, is a lengthy one and the 'worm' or larval stage may last

two, three or four seasons according to the species of Wireworm and also according to conditions of climate and soil. After its lengthy life, the 'worm' changes into the pupa at the end of the summer and in two or four weeks the pupa changes into the adult beetle which hibernates until the following spring when it emerges to lay its eggs. At Ottawa, adults were seen flying on sunny mornings of the last week in April. It is customary, therefore, to find Wireworms of different ages in the soil, and these pass the winter in this situation. Consequently, the best method of treatment, as in the case of the White Grub, is one of cultivation, and the greatest benefit can be obtained by adopting the same measures, namely, deep ploughing in the fall to expose the larvæ and pupæ. Clover or buckwheat may be sown on grass land which has been turned down to cultivation if it is not desired to leave the land under summer-fallow which is the procedure to be most recommended; but a clean fallow is not always successful. On account of the hard and resistant nature of the Wireworm and its position during life it is almost impossible to treat it with insecticidal substances and these are not to be recommended. Penning sheep on grass land intended for cultivation is sometimes attended with good results as the sheep tread the soil down firmly and prevent the movement of the Wireworms, and by heavily manuring the land, make it unattractive to the beetles. It has been frequently recommended to dip the seeds or grain in certain preparations or chemicals before planting in order to prevent the attacks of Wireworms. Careful investigations into these methods and remedies have shown that, as a rule, they are useless, and to adopt such methods is a waste of time and money. It is evident that the fact of the grain being coated with a poisonous substance will not prevent the Wireworm from eating the young roots, which are of course not poisoned, as is its custom, and thus killing the young plant.

ROOT MAGGOTS.

From year to year, the attacks of these insects appear to assume greater proportions and from all provinces the injuries of the different species to roots and other field and garden crops are reported, many of these reports indicating the serious nature of the injuries, and the aggregate loss due to these insects alone must be very great. In the vicinity of Edmonton it is said to be extremely difficult to grow onions on account of the Onion Maggot (*Phorbia ceparum* Meig). In the same district the Cabbage Root Maggot (*P. brassicæ* Bouché) destroyed early cabbages and cauliflowers. One correspondent planted about 2,000 late cabbages and large numbers of the eggs were seen round the stems of nearly all. In Ontario. cabbage, radishes and cauliflowers were attacked A correspondent at Munro, B.C., had most of his turnips killed when quite young; when the remainder were harvested it was found that the portions of the turnips underground were masses of maggots. These insects have now appeared so far north as the Yukon territory where their presence was unknown a few years ago, but they were reported during the past year as attacking turnips, radishes and onions.

The Cabbage Root Maggot *(Phorbia brassicæ)* and the Onion Maggot (*P. ceparum*) have been responsible for the most of the injuries reported to the Division. The Seed Corn Maggot (*P. fusciceps* Zett.) is not infrequently responsible for serious injuries to Indian corn and beans in Canada.

When studying the breeding habits of an allied species, (*Anthomyia radicum* L.) in England a few years ago, it was found that the female flies were attracted to manure in which they laid their eggs and the larvæ or maggots developed in the manure. This explains a fact which is frequently noticed, namely, that root maggots are more numerous and injurious on land which has either been freshly manured or heavily manured, and the number of instances of the influence of stable manure

in attracting the flies and serving as additional food for the maggots have come to my notice. The flies into which these maggots develop are somewhat similar in appearance to small house-flies, and they lay their eggs round the bases of the young plants early in the summer, the worst damage being usually experienced in June and July. Vegetables which are planted early withstand the attacks of the maggots better than those planted later, which sometimes appear quite healthy one day and are withered the next. Mr. Fyles states that radishes sown at Quebec in the beginning of May are a success; radishes sown at Ottawa in May are attacked. The development of these insects may be complete in two or three weeks and there are a number of broods during the season, the injuries becoming more serious with the increase in the numbers of the flies. The winter is passed in the brown pupal stage.

As these insects are becoming so seriously troublesome in Canada, it is important that farmers and others should be familiar with those measures by the application of which benefit has been derived in the prevention, control and eradication of the different species of root maggots. It should be remembered that the value of a particular measure depends on a number of natural factors such as locality, climatic cônditions, nature of crop, &c., and a remedy which may be effective one year may not give the same results in the following year.

TARRED PAPER CARDS.

The method of control which has proved most successful in the protection of cabbages and cauliflowers from the attacks of the Cabbage Root Maggot, and at the same time very cheap, is Goff's tarred paper card device. The principle of this method is the surrounding of the stem of the transplanted seedling with a tarred paper card which closely encircles the stem of the plant and lies flat on the ground; by this means the female flies are prevented from laying their eggs at the base of the stem of the cabbage or cauliflower. If this method is continued for several years it will be found to be the best protection against the Cabbage Root Maggot. The tarred paper cards are cut out by means of a special tool shown at A in Figure 1. This must be carefully made by a blacksmith, and the cutting blade consists of a half hexagon, from one corner of which the blade passes to the centre and finishes in a star-shaped stud which makes the star-shaped cuts in the centre of the card. The edge of the tarred paper is first cut into the shape shown in Figure C by using one angle of the tool only. The complete cards are now cut out by beginning on the left-hand side and placing the blade of the cutting tool as indicated by the dotted lines; in this way, by tapping the handle of the cutting tool with a mallet, a complete hexagonal disc similar to B is struck off and this process is continued across the paper. In each line there will be a certain portion of the paper left over in cutting the hexagons. When the seedlings are transplanted the cards are placed round their bases by opening the slit and slipping it round the stem which passes through the star-shaped cut in the centre of the card. It is extremely important to place these cards on the plants correctly, as carelessness in fixing them will render them useless. The card should fit tightly round the base of the stem of the plant and should be perfectly flat upon and close to the ground, as shown in Figure D. Figure E shows how the cards should *not* be applied. If the soil is inclined to be rough or lumpy, it should be rolled before the planting of the seedlings in order that the cards may lie flat on the ground and fit well round the bases of the seedlings. In practice, this has been found to be the cheapest and most effectual method yet devised. It is not possible to use this method against the root maggots attacking such vegetables as onions, radishes or turnips, and for these the carbolic emulsion may be used, as it has been found effectual and is cheap, although in certain cases it is not infallible; Slingerland's formula is; 1 lb. of hard soap or 1 quart of soft soap dissolved in a gallon of boiling water, a pint of *crude* carbolic acid is then added and the whole is agitated into an emulsion which

will keep for some time. One part of this is diluted with thirty to fifty parts of water. It should be applied early, when the plants are coming up. The roots of seedlings to be transplanted should be dipped in the emulsion, and then the bases of the plants should be watered well with the emulsion every week or ten days. Watering the plants about once a week with a decoration of hellebore, using two ounces of hellebore to one gallon of water, will give good results in the case of radishes.

Where small plots of cabbages or other vegetables are grown, they may be protected from the Root Maggot flies by covering the plants early in the season with cheese-cloth screening stretched over frames. The lower edges of the cheese cloth should be spread a little on the ground and covered with earth to prevent the flies from creeping under. Some growers might find it economical to prepare frames covered with a weather-resisting, bronze wire fly screen. The injection of carbon bisulphide near the bases of the plants has been found effective in the destruction of the maggots.

Particular attention should be paid to methods of cultivation. Weeds belonging to the same family of plants as the cabbage, namely the Cruciferæ, such as wild mustard, &c., should be destroyed; but, in good farming, this applies to all weeds. Deep ploughing in the fall would tend to bury many of the pupæ, in which stage the winter is passed, too deep in the soil for the emergence of the fly in the following year.

APHIDES AND SCALE INSECTS.

The season of 1909 was an exceptional one in Canada for the abundance of the different species of aphides or plant lice and also the allied scale insects. This was also the experience in the United States and in England. Our knowledge of the bionomics of these insects is, as yet, insufficient to enable us to explain this abnormal abundance, but observations on the reproduction of aphides suggest a possible explanation. The abundance of aphid life is dependent upon the rate of reproduction of aphides, and this, I have found in a number of cases studied, is dependent on the amount of sap present on the trees or plants upon which they are feeding. A large amount of sap, in other words an abundance of food, encourages growth and reproduction. The amount of sap in most plants is dependent primarily upon the rainfall and such meteorological conditions as the humidity of the atmosphere. A study of the records shows that the rainfall of the spring and summer of 1909 was considerably higher than the normal; the temperature of January, February and March was higher than usual, the winter being favourable for trees, and, notwithstanding a wet and backward spring, the month of June was noticeable for the luxuriant growth of vegetation, the luxuriance of which was maintained by the heavier rainfall of the succeeding months. Such conditions, and the lack of sufficient numbers of parasitic and predaceous enemies may account, I think, for the abnormal abundance of aphides in certain years. The importance of knowing these conditions with certainty is very great, as, when that is accomplished, it will be possible, to a great extent, to predict the abundance or scarcity of aphid life and to act accordingly.

The rapid rate at which aphides are able to reproduce is due to two facts: first, that they are able to reproduce parthenogenetically; that is, an unfertilized female is able to reproduce; secondly, such a female produces living young instead of eggs. These females, therefore, are able to produce large numbers of their kind which in turn are themselves able to reproduce in like manner in the course of a few days.

The different species were very abundant in the early part of the year on herbaceous plants, trees, conifers, cereals, &c. Fruit trees suffered considerably from the Apple Aphis which largely ruined good crops in certain localities; the Plum Aphis and, in British Columbia, the Cherry Aphis, were abundant. The life history of a typical aphid or plant louse is briefly as follows: The winter is passed in the egg stage and

the eggs may be found often in large numbers on the twigs of the trees, those of the Apple Aphis being shiny, black, oval bodies. In the spring, usually when the buds are opening, the eggs hatch and the minute plant lice make their way into the unfolding leaves where they immediately begin to suck the sap from the tender foliage and soon grow to their full size. These individuals now begin to produce living young ones and this continues from generation to generation during the summer, these generations being wingless. In some species complications are introduced owing to the fact that a winged generation is produced which migrates to a different host plant and there continues the life history of the species; in some cases the egg stage and spring generation is passed on plants of a woody character and the early summer generation migrates to some crop which dies down in the winter. The Hop Aphis (*Phorodon humuli* Schrank) passes the summer on the hop, but winged forms migrate to the plum (including wild plum) in the fall and from these, sexual forms are produced which deposit eggs on the twigs of the plums from which the spring generations are produced. In the fall, this production of living young by virgin females ceases and sexual forms, males and females, are produced which may or may not be winged—the males are usually winged. These sexual and fertilized females deposit the winter eggs. The remedies for aphides are winter spraying with lime washes or lime-sulphur and spring spraying with kerosene emulsion. The method of preparing these insecticides is given under the description of the Oyster-shell Scale. For a summer spray, it is difficult to find a more effective and cheaper spray than the home-made tobacco decoction. The tobacco can be grown and dried at home and an excellent contact spray for aphides is made by soaking for several hours one pound of this tobacco, or two pounds of tobacco stems or dust in four gallons of water which is almost boiling and applying the solution warm. The *water must not be boiled after the tobacco has been immersed;* it should be kept hot but not boiled or the nicotine will begin to volatilize.

The Woolly Aphis of the Apple (*Schizoneura lanigera,* Hausm) appears to be increasing, having been recorded from Ontario and Nova Scotia. Fruit growers should take all measures possible to eradicate this most serious pest which is especially insidious as it attacks the roots of the tree in addition to the branches, and the root form, once established, is difficult to eradicate. The aerial form of the Woolly Aphis may be treated in the same manner as other aphides, but it is necessary to adopt special measures to eradicate the root form. All nursery stock should be most carefully fumigated or dipped in kerosene emulsion before being planted; this will prevent its introduction on nursery stock, which is a common means of distribution. If the branches or twigs are attacked by Woolly Aphis, it is very probable that the root form occurs also and treatment should be adopted accordingly. Remove the soil to a depth of four to six inches round the base of the tree to a distance of about two feet from the crown, the ground and roots should now be drenched with a strong solution of kerosene emulsion or with a strong decoction of tobacco. The use of dry tobacco ash has also been found effectual. Another method may be used if the soil is dry and not too heavy; namely, the injection of carbon bisulphide into the ground about 18 inches from the crown of the tree, taking care not to touch the roots. This liquid volatilizes and the gas, which is poisonous to insect life, percolates through the soil.

In certain cities, such as Toronto and Quebec, the elms have been attacked by the Woolly Elm Bark Aphis (*Schizoneura rileyi* Thomas).

The Woolly Aphis of the Alder (*Pemphigus tessellata* Fitch) was very common and specimens collected near Ottawa in September were being preyed upon by the caterpillar of the little orange butterfly called 'The Wanderer' (*Feniseca tarquinius* Fabr.).

THE OYSTER-SHELL SCALE (*Lepidosaphes ulmi* Linn.) or, as it is sometimes wrongly called the Oyster-shell Bark Louse, which name rightly belongs to another scale insect (*Aspidiotus ostreæformis* Curtis), is increasing in most of the provinces; in Ontario it has become a serious pest and appears to be doing as much damage as the San José Scale and Codling Moth as it occurs in almost every orchard. This increase is due largely to neglect on the part of many fruit growers who own but a few, usually old, trees which are not infrequently covered with scale. During the winter the scale, which resembles somewhat the shape of a blue-point oyster, acts as a protective covering for the yellowish-white egg, which may number as many as 80 under a single scale. The eggs hatch in May and June and the young six-legged larvæ creep out and seek a fresh site where they soon settle down and form a protective scale under which they live, feeding on the sap of the tree and, after laying their eggs at the end of the summer, they die. Most of the individuals are females and these are wingless; the males are winged and rare. The following methods of eradication may be employed:—

1. The trees should be sprayed shortly before the buds open in the spring with either a simple lime-wash (using about 1½ pounds of lime to a gallon of water), or lime-sulphur. The lime-wash is effective partly owing to its caustic action and partly by preventing the emergence of the young larvæ. As in all such spraying, the whole of the tree including the ends of the twigs should be well covered with the spray solution. The home-boiled lime-sulphur wash is preferable to the commercial lime-sulphur for this spring spraying of dormant trees and is made in the following manner:—

Unslaked lump lime, 20 lbs.; sulphur, 15 lbs.; water 45 gallons. Slake the lime with warm water and while it is boiling hot add the sulphur and stir thoroughly. The whole is now boiled steadily over a fire, or by means of steam, adding more water when necessary until the mixture is of a deep reddish brown colour. Sufficient water should be added to make it up to 45 gallons and after a few minutes further boiling the solution should be strained and applied as warm as possible. If it crystallizes, it will be necessary to reboil. Very bady infested trees should have an extra spraying in the fall. If the trees are thoroughly and regularly sprayed each year with lime or lime-sulphur, this and other scales will be eradicated and the trees will be kept clean.

2. A careful watch should be kept for the emergence of the young larvæ and as soon as they appear, as yellowish white specks crawling about on the bark, the trees should be sprayed with kerosene emulsion. Kerosene emulsion is made as follows:—

Kerosene (coal oil), 2 gallons; whale-oil soap, ½ lb.; soft water, 1 gallon. Dissolve the soap by boiling in water. While the solution is boiling hot, take it away from the fire and pour it into the kerosene. The solution is now violently churned and agitated for about 5 minutes to form a emulsion. This is the stock solution, and, if well made, will keep. In the summer, use it in the proportion of one part to 10 or 12 parts of water. For winter use and for the root form of Woolly Aphis, a stronger solution is made by adding eleven gallons of water to this stock solution. Whale-oil soap, using one pound of whale-oil soap to five gallons of water, may be used instead of kerosene emulsion. Commercial lime-sulphur used in the proportion of one part in 30 parts of water has also been found useful.

THE SAN JOSÉ SCALE (*Aspidiotus perniciosus*, Comst.). During the past year, this insect has spread slightly; cases were reported from York and Prince Edward counties, Ontario, and a single case from Zephyr, Ontario. The latter case was eradicated and the other cases were due to the transference of infected stock from the infected regions in the province. No further cases of the introduction of this insect have been reported from the other provinces of the Dominion, which attests to the efficacy of the fumigation stations. Although the appearance of this scale is not yet familiar to all fruit growers, the methods of eradica-

tion are too well known to necessitate their repetition. The system of winter spraying with lime-sulphur in its several forms, home-made, commercial and self-boiled, has now become so necessary an operation in the cultural systems of the successful and progressive fruit grower that, with its universal adoption, it is not too much to predict the control of this and other scales. Wherever it has been regularly used each year, the scale has been controlled and far better crops of fruit have been produced. The indifferent fruit growers are the greatest obstacles to the attainment of such conditions of control and we must rely on legislation and neighbourly influence to overcome the greatest of obstacles to all progress—indifference.

THE TERRAPIN SCALE (*Eulecanium nigrofasciatum* Perg.) was injurious to ornamental maple trees in the southern part of Ontario. It was destructive at Hamilton, Chatham and Humberstone, Ont., but it is a hopeful sign that large proportions of the scales were parasitized.

THE BROWN-TAIL MOTH (*Euproctis chrysorrhœa* L.).

Nova Scotia is still the only province in which this serious pest is known to have established itself, and, since its discovery in that province in 1907, the Provincial Department of Agriculture have carried on annually a most active campaign in the endeavour to obtain control of this insect. Principal Cumming, Secretary of Agriculture, Nova Scotia; Prof. Smith, of the Agricultural College, Truro, and Mr. Vroom, of the Fruit Division of the Dominion Department of Agriculture, have all worked assiduously to attain this end. In the spring of 1907, when the presence of the insect was discovered, over 6,000 nests were destroyed and in the following year about 4,000 nests were known to have been destroyed; these numbers probably represent more than actual nests of the Brown-tail Moth owing to the bounty system which was in vogue as an emergency expedient and under which mistakes might easily be made. In 1909, a careful inspection resulted in the destruction of over 800 nests and during the present winter a large number have been found up to the time of writing. Notwithstanding the increase of the number of nests, it is satisfactory to find as a result of a personal visit and the evidence of Prof. Smith and others, that no nests could have occurred in the districts west of Digby. The most seriously infested localities lie in the district between Smith's Corner, Digby county, on the west and Middleton and Nictaux, Annapolis county, on the east, a district between 40 and 50 miles in extent. With the exception of Nictaux, the western part of this region, including such localities as Bear River and Deep Brook, is the most seriously infested. This region is being thoroughly worked over by Messrs. Payne and Brown of the Provincial Department of Agriculture, and also by Mr. Vroom. In New Brunswick, where there is still greater danger of invasion by this insect, only a few specimens of males have been found. A considerable number of cocoons of the Emperor Moth (*Samia cecropia* L) have been sent to the Division in the fear that they were nests of the Brown-tail Moth. The Department of Agriculture of New Brunswick commissioned Mr. William McIntosh, an observant entomologist, to traverse the country likely to be infested and also to distribute literature and advice in the schools. Up to the present, no signs of the insect having established itself in that province have been discovered. To prevent the introduction of the insect in the form of winter nests on nursery stock imported from Europe, this stock was carefully inspected at the points of destination by our own officers, Mr. Gibson and Mr. Treherne who acted as special inspector. The following letter was sent to all the Canadian nurserymen on our list and the agricultural papers in the different provinces:—

DIVISION OF ENTOMOLOGY,
CENTRAL EXPERIMENTAL FARM, OTTAWA,
January 5, 1910.

To Nurserymen and others:—

We are again confronted with the possible introduction of the Brown-tail Moth into the Dominion in the shape of the winter nests on nursery stock imported from abroad, especially from certain regions in France where nursery stock has been growing in fields bounded by hedges infested with the Brown-tail Moth.

Last year nurserymen and other importers co-operated with this Division in the work of preventing the introduction of this insect by advising us of the arrival and expected arrival of consignments of nursery stock from abroad. This enabled the Division to inspect the stock and to destroy any of the winter nests that were found. Over a million and a half plants were examined and nearly two hundred nests were found on seedlings and stocks of pear, apple, plum, quince, cherry, rose, spiræa, &c. In view of the fact that each nest may contain from 200 to 300 larvæ of this insect, the great benefit to fruit growers, horticulturists and others resulting from the work of last season can readily be understood. In the eastern States thousands of dollars are being spent annually by the various authorities in their efforts to control and prevent the spread of this insect, which has established itself in those regions since its introduction into Massachusetts on imported stock about the year 1890. It is of the utmost importance that all steps possible shall be taken to prevent its introduction and establishment in those regions of Canada now free from its attack, and its further spreading in those places in Nova Scotia and New Brunswick where it has been introduced accidentally. Its establishment in Canada would be most serious to the nurserymen and fruit growers of this country, and every precaution possible must be taken to avert such a calamity.

Will you kindly inform me, therefore, if you are importing or have already imported nursery stock this season from abroad, and the place from which the stock is being or has been imported.

As nests have been found on stock imported during the present season, I should be pleased if you would send me this information at once in order that your stock may be inspected, if necessary. If the stock has not arrived already, would you please send me notice as to the time of its arrival in order that it may be inspected at the time of unpacking, and thus the least inconvenience will be caused.

It has been found that fumigation is of no avail against this insect, and that destruction by burning of the winter nests is the only safe remedy.

I feel sure that all to whom this letter is addressed will be alive to the seriousness of the danger which is imminent, and will co-operate with the Division and other authorities in the efforts being taken to prevent the introduction and spread of the Brown-tail Moth. I shall be pleased to supply further information or reply to communications on the subject, and shall be grateful for any assistance which you are able to give me.

I have the honour to be, sir,
Your obedient servant,

C. GORDON HEWITT,
Dominion Entomologist.

The Department of Agriculture of Ontario willingly co-operated and gave us the assistance of an inspector. Through the courtesy of the importing nurserymen, every case of nursery stock is being carefully inspected. It is a pleasure to acknowledge the assistance of Dr. L. O. Howard, Entomologist and Chief of the Bureau of

Entomology of the United States Department of Agriculture, who has notified us of a large number of shipments of European nursery stock passing through the United States *en route* for Canada, and also the assistance of Mr. Geo. G. Atwood of the New York State Department of Agriculture, who also sent notifications. These notifications assisted us in making arrangements for the inspection of the stock, and we were also notified of the arrival of nursery stock by the Collector of Customs at the different ports of entry by arrangement with the Department of Customs. In British Columbia the inspection was left in the hands of the Department of Agriculture for that province, and Mr. T. Cunningham, the Provincial Inspector of Fruit Pests, has assured us of the extra care that is being taken in the inspection of European stock.

This inspection is resulting in the finding of several hundreds of the winter nests on imported stock. The results of last season's inspection, which was concluded in May of the present fiscal year, were given in the last annual report; but as the inspection in Nova Scotia, in Ontario and in British Columbia is not yet concluded, the results must necessarily be deferred until the next year's report. The results of this season's inspection so far indicates that a greater number of nests are being discovered on European stock and a larger amount is being examined. Under the new Destructive Insect and Pest Bill* now before Parliament, it will be possible to inspect all European and other nursery stock likely to be infected with the winter nests of the Brown-tail Moth upon its arrival in Canada, and also to inspect orchards and other premises upon which it may occur. The greatest danger is the indifference on the part of the public and the failure to realize the serious importance of this pest which is entailing an annual expenditure of over a million dollars in the New England States. Its presence in the form of the winter nests or webs is easily discovered and its destruction is still more easy. The simplest means of eradication is the cutting off and burning of the winter nests, which may contain from a few dozen to as many as two thousand caterpillars; the usual number being about two or three hundred in a nest of average size. During the five winter months, when the leaves are off the trees, these nests are readily seen and it is during this period that a careful search should be made of orchards likely to be infested, and such adjacent trees as wild thorn and apple. The nests have also been found on oak, maple and elm in Nova Scotia, and the danger of the insect establishing itself in the forests and bush is one of the most serious aspects of the problem, as it affects us at present. In the States of Maine and New Hampshire it is gradually spreading northwards, and in the north-eastern region of Maine has reached already the international boundary, the St. Croix river. It is of the greatest importance, therefore, that a most careful watch should be kept in the townships bordering the frontier and, should anything be found, it should be immediately reported to the Department, and any objects that may be suspected as nests of the Brown-tail Moth should be forwarded for identification. A full account of the life-history and methods of eradication of this insect have already been given in the reports of the Division for 1906 and 1909, and, as a special bulletin is in preparation, it is not intended to consider at further length what is at present the most serious insect pest with which we have to contend.

A SYSTEM OF SPRAYING FOR INSECTS ATTACKING APPLE.

Reference will be made later to the species of insects which have proved injurious to fruit and fruit trees in Canada during the past year but, before considering these, it has been thought advisable to explain how a uniform system of spraying will serve to control a number of these insects which are injurious to the foliage and fruit. Immediately the buds have opened, the half-grown caterpillars af the Eye-spotted

* The Destructive Insect and Pest Act was passed shortly after the end of the fiscal year and the Regulations were ordered in May.

Bud-moth, and, if they are present, the larvæ emerging from the winter nests of the Brown-tail Moth, and sometimes the hibernated adults of the Plum Curculio, all begin to feed on the young and tender foliage and in a few days they are assisted by the numerous newly-hatched Tent Caterpillars. All these insects could be controlled to a very great extent by *an early spraying* when the leaves are unfolding. The importance of this spraying cannot be too strongly urged. Later, when the blossoms are falling and the young fruit is forming, the Codling Moth caterpillar makes its appearance; a second spraying with an arsenical spray is necessary for this, especially as the largest proportion of the eggs of the Codling Moth are deposited on the foliage upon which the larvæ feed for a short time before making their way to the still open calyx of the young apple. To control this insect, and such others as the Canker-worms and Tent Caterpillars which are beginning to feed about this time, *a second arsenical spraying* should be given and this application should be most thorough. covering the upper and lower sides of the leaves and taking care to fill the calyces of the newly formed fruit with the solution. *A third application* of the spray should be made a fortnight later. This is essential, as, in many instances, the eggs of the Codling Moth and other caterpillars are late in hatching, or the hatching extends over a considerable period. Also, in certain cases, the Plum Curculio is a pest about this time and injures the young apples. Where a second or partial second, brood of the Codling Moth occurs, it will be necessary to make a fourth application to control the progeny of those insects of the first brood that escaped the effect of the previous sprayings. This application should be made from six to eight weeks after the falling of the blossoms.

Experiments have been carried on in America and in Europe for many years with a view to finding the best arsenical poison to use for these leaf-eating beetles and caterpillars and the results on the whole furnish strong evidence as to the superiority of lead arsenate over other arsenical compounds. This superiority is due to the following properties of lead arsenate.

1. It may be applied to tender foliage and does not scorch or burn it.

2. It is in the form of a finely divided precipitate and, in consequence, it is unnecessary to constantly agitate the spray fluid to ensure the even distribution and constant strength of the arsenical.

3. It is more adhesive to the foliage than Paris green, remaining on the trees longer, and, being white in colour, it is possible to see that the trees are thoroughly sprayed. In all these applications it should be mixed with the Bordeaux mixture or lime-sulphur, whichever of these are used to control the fungal diseases and should be mixed in the proportion of two to three pounds of lead arsenate to a barrel (40 imperial gallons) of the Bordeaux mixture. If lime-sulphur is used, it will be found that the best results are obtained by using the self-boiled lime-sulphur and adding the lead arsenate in the same proportion as above. Great care should be taken in the preparation of the Bordeaux mixture or its alternative the lime-sulphur mixture, as the burning of foliage and injury to the young fruit is, in the majority of cases, due to a mistake in making the mixture. The methods for making these insecticides are given in detail in the report of the Dominion Botanist for the present year.

INSECTS INJURIOUS TO FRUIT AND FRUIT TREES.

The Codling Moth (*Carpocapsa pomonella* L.)

This still continues to be one of the most injurious insects with which fruit growers have to contend. It can be controlled, if growers are only willing to take the necessary steps: systematic spraying at the correct times and from year to year. Much trouble is caused, as I have pointed out previously, by the indifferent persons who do not spray and whose orchards act as reservoirs for this and other insect pests.

Such indifference can only be overcome by education and example. Where there are two annual broods of the insect, it is necessary to band the trees with burlap, leaving the upper and lower edges of the burlap open. Even when one brood only is normally present, the value of the burlap is probably sufficient to warrant its use. Experiments have shown that if the trees are banded early in August and the burlap examined at weekly intervals, a considerable number of cocoons are obtained which would otherwise have escaped.

THE BUD-WORM OR EYE-SPOTTED BUD MOTH (*Tmetocera ocellana* Schiff.).

In Nova Scotia, the injuries due to this insect were of a serious character during the year although it did not appear to be so injurious in Ontario. There appears to be a marked periodicity in its abundance. The difficulty in dealing with the Bud-worm lies in the fact that it not infrequently has committed the most serious damage, that is, the destruction of the young leaves and immature blossom in the opening bud, before its presence is noticed. It is therefore necessary to be prepared, and to take the necessary steps *before* the injury is done by this insect as it is far more serious than a mere leaf-defoliator. It is one of the worst pests of the apple in that it destroys the young leaves and blossoms before these have had a start and is therefore capable of causing the entire destruction of the crop.

The young larva, measuring about one-eighth of an inch in length, passes the winter as a young caterpillar of a brown colour with a black head, sheltered in a small cocoon-like structure which is usually formed in the crotch between two twigs or between the twig and a bud. When the buds are opening, it emerges and begins to feed on the immature leaves and flowers and continues to feed until June or July when it spins a cocoon among the dead leaves on the twig, and the small grayish moth measuring about three-fifths of an inch across its wings emerges in July. It derives its name from the fact that it possesses an eye-like spot on each of the fore-wings. Flying by night, these moths deposit their inconspicuous eggs on the leaves. In about ten days these eggs hatch and the young larva feeds on the lower side of the leaf near the midrib. It feeds sparingly on the soft tissues of the leaf and its growth is extremely slow. For eight or ten weeks it continues to live in this position constructing for itself a filmy silk-like covering as it continues feeding. In September it ceases to feed and seeks a convenient niche in which to spin its winter case, and thus sheltered it remains until the buds open in the following spring. It will be seen, therefore, that there is a single annual brood only and the insect is remarkable for the comparatively great length of time which it spends as a small larva, hardly measuring one-eighth of an inch in length. The early spraying suggested previously is essential for the control of this serious enemy of the apple.

THE APPLE MAGGOT (*Rhagoletis (Trypeta) pomonella* Walsh).

In many orchards in Quebec this insect, or as it is sometimes called the 'Rail-road worm' on account of the peculiar winding tracks it makes in the pulp of the apple, is one of the most serious insects attacking the apple. The insect belongs to a large family of two-winged flies—the *Trypetidæ*, which are popularly known as the Fruit-flies. They are small flies with banded or mottled wings and may be seen hovering round ripe and rotten fruit. In this country and in the United States *R. pomonella*, the Apple Maggot, is one of the worst apple insects in those districts in which it occurs; in Italy the Olive-fly (*Dacus oleæ* Rossi) is the most serious pest of the olive; the Mediterranean Fruit Fly (*Ceratitis capitata* Wiedemann) is very destructive to oranges in the regions round the Mediterranean. *Rhagoletis cerasi* Linn. is very destructive to cherries in Europe. In Queensland and New Sotuh Wales the Queensland Fruit Fly (*Dacus tryoni* Froggart), has caused great loss wherever it occurs, as it attacks a large number of species of fruits such as the peach, nectar-

ine, orange and banana, and occasionally the possibility of the introduction of this species into British Columbia has been the cause of some alarm.

The chief reason for the serious nature of these fruit flies is that the injury is done by the maggots or larva of the fly *inside* the fruit and in this connection they cannot be reached by insecticides. The female fly usually begins to deposit her eggs in July and continues to do so during the summer months. By means of her sharp ovipositor the egg is inserted beneath the skin of the apple so that the larva, on hatching, immediately begins to feed and as it feeds it makes brownish, discoloured burrows through the pulp until it is full grown, which is in about six weeks. A single apple may contain a number of maggots, the work of which causes the fruit to ripen prematurely and fall to the ground. The full-grown maggot then leaves the fruit and enters the soil to the depth of about two inches and changes into a brown puparium. In this state it passes the winter, emerging as a fly in the following June.

The most sure remedy, therefore, is to gather and destroy by burning the prematurely ripened and fallen fruit *as soon as it falls.* In this manner, the maggots are gathered before they leave the apple and can be destroyed. Wherever this plan has been adopted in orchards affected with the Apple Maggot, it has been found that there has been a considerable diminution in the number of apples affected, but it is necessary to collect the fallen fruit at once in order to obtain the best results. The turning of pigs into the orchard to destroy the fallen fruit has met with success, but many orchardists prefer to keep animals out of the orchard. An important fact is generally overlooked. It is extremely probable that the Apple Maggot (*R. pomonella*) is a native of North America and originally fed on the wild crabs, haws and certain other *Crataegi,* upon which it still feeds. If such trees exist, therefore, in the neighbourhood of orchards infested with Apple Maggot they should be cut down; otherwise they will serve as a breeding ground, furnishing a constant supply of the insects and all attempts to destroy them in the orchard will be frustrated.

Recently, some interesting experiments have been carried on with a view to destroying the female fruit flies before they lay their eggs. Their love for sweet substances is well known, and this fact has been put to practical use by spraying the foliage of the fruit trees in places with a sweetened arsenical, or hanging small supplies of the sweetened arsenical or poisoned bait in various places among the fruit trees. Such methods have been followed with success by Prof. Antonio Berlese in Italy against the Olive Fruit-fly (*D. oleæ*) and by Mr. Mally against the Fruit fly (*Ceratitis capitata*) in South Africa. The latter used a poisoned bait of the following composition: Sugar, 3 lbs., arsenate of lead, 4 ozs, and 5 gallons of water. It was applied to the trees by means of an ordinary brass garden syringe, using about a pint to a pint and a half to each tree (of about 10 years old). The object is not to thoroughly spray the trees but to throw the solution in fairly large drops on to each tree when the flies first appear and before they lay their eggs. They are attracted to the poisoned bait and die as a result of feeding upon it. It should be applied at least every ten days. It is hoped to carry out some experiments in Canada with a view to testing the efficacy of the Mally formula and Prof. Berlese's formula which differs slightly, but the former is described here in case certain fruit growers should wish to test it. The possible injury to bees has been suggested, but in the trials in South Africa careful attention was paid to this question and it was found that honey bees did not pay any attention to the solution. As the different broods of the Apple Maggot extend over the whole of the summer, it frequently happens that the fruit that is gathered contains growing maggots. Such fruit is packed and the maggots, having finished their growth, leave the apples and pupate in the barrels or cases. In this manner, the insect is often distributed to regions not previously infested. Care should be taken, therefore, to carefully collect and burn all the refuse from fruit stored in rooms or barrels before the flies emerge, which may be as early as May when the pupae are kept indoors. It has been found that by keeping the infested fruit for

a number of weeks in cold storage, the maggots are killed by the prolonged low temperature.

The Plum Curculio (*Conotrachelus nenuphar* Herbst).

In addition to being one of the worst pests attacking plums, this weevil is responsible for serious damage to apples. In the province of Quebec, its attentions are chiefly confined to the apple, and in Ontario considerable injury is frequently caused in June and July and also from August to October by the weevils puncturing the fruit and the formation of wounds and small decayed spots caused by the rotting of the apple in the neighbourhood of the puncture. It was reported from Hamilton, Prince Edward Island, as injuring cherries. The emergence in the spring of the adult weevil from its hibernation varies considerably, and may extend from the time the leaves are unfolding until several weeks later. The system of spraying recommended will be of great benefit in the destruction of the weevils as they feed for a short time on the young foliage and fruit before laying their eggs in the fruit. In this manner, the proportion of infested fruit will be greatly reduced. In a number of experiments carried out by Mr. F. L. Washburn, State Entomologist of Minnesota, he obtained 53 per cent of marketable fruit when the trees were not sprayed, and 77 per cent of marketable fruit (in the following year, 1908, he obtained 86·4 per cent) when three applications similar to those which have been suggested were made. As the larvæ are in the apples when they fall to the ground, the destruction of the windfalls, as in the case of the Apple Maggot, will reduce the numbers of the insect very considerably. A method which is very frequently employed for the destruction of the adult weevils is that of jarring the trees and causing the beetles, which feign death and drop when disturbed, to fall into a sheet spread beneath the tree; the beetles so collected are then emptied into a can of water, the top of which is covered with kerosene.

Cankerworms.

Two of these insects, the Spring Cankerworm (*Paleacrita vernata* Peck.), and the Fall Cankerworm (*Anisopteryx pometaria* Harris) have been injurious. The loss caused by the Fall Cankerworm has been very great in certain regions, especially in Nova Scotia, where orchards were completely stripped and were very noticeable on account of their brown appearance. The latter species can be distinguished from the former by the fact that it possesses three pairs of clasping legs on the hinder region of the body, whereas the Spring Cankerworm possesses two pairs only. The female moths are inconspicuous, wingless insects, and emerge from October to May, during the time of the year when the leaves are off the trees. They crawl up the trunk and deposit their eggs in regular masses on the twigs. This habit and the wingless character of the female provide an important means of control. Each tree should be banded about four feet above the ground or below the lower branches with a three or four-inch band of 'Tanglefoot' (a good substitute can be made by dissolving resin by heating, and mixing it with an equal part of boiling castor oil). This is applied before the beginning of October, and in the case of the Fall Cankerworm care must be taken to keep the surface of the tanglefoot fresh by passing a coarse wooden comb round it and also to preserve its continuity around the tree. When the female moths emerge they crawl up the trunk and are prevented from reaching the branches by the tanglefoot bands; unless this is kept fresh, however, it will be bridged over by their dead bodies and its object will not be accomplished. This method of destroying the females and preventing them from laying eggs, which is the most essential means of combatting the insect should be supplemented by spraying with arsenate of lead, using not less than three pounds of the arsenical to 40 imperial gallons of water, (or Bordeaux Mixture, if the combined spray is used).

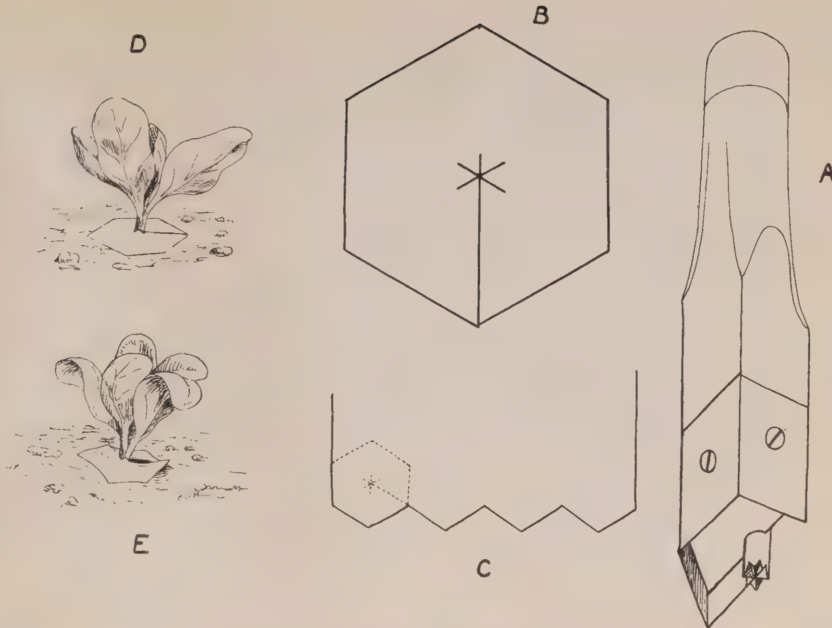


FIG. 1.—Goff's Tarred paper device for the Cabbage Root Maggot.

FIG. 2.—The Cabbage Maggot: 1, maggot; 2, 3, pupa case; 4, fly—1, 3 and 4 enlarged.

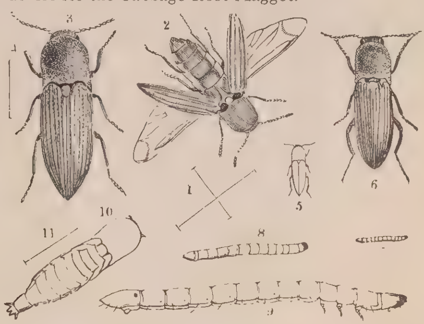


FIG. 3.—Wireworms (7, 8, 9); pupa (10)—enlarged; click-beetles (5—natural size; 2, 3, 6—enlarged). *(Curtis.)*

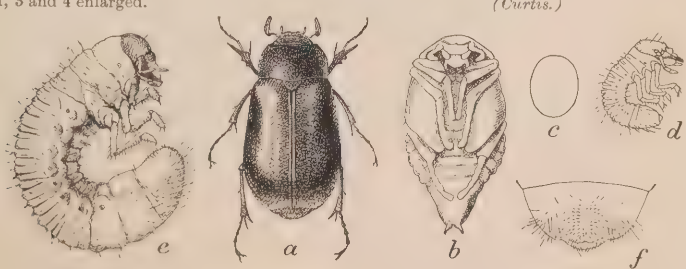


FIG. 4.—May Beetle: *a*, beetle; *b*, pupa; *e*, larva (White Grub)—slightly enlarged.
(Chittenden, Bull. 19, n.s., Div. of Ent., U.S. Dept. of Agr.)

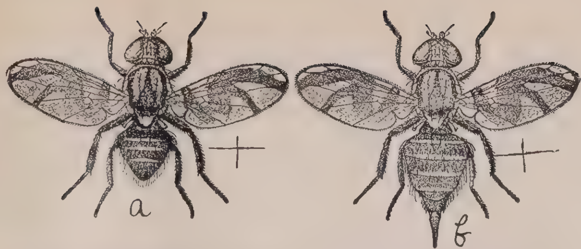


FIG. 5.—Flies of the Apple Maggot : *a*, male ; *b*, female—enlarged.

FIG. 6.—Apple infested by Apple Maggot.

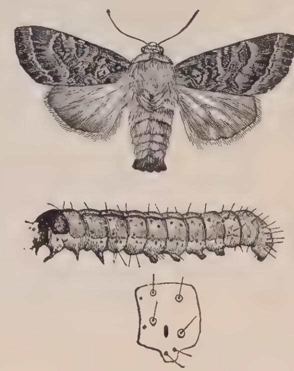


FIG. 7.—The Glassy Cutworm :
moth and caterpillar.

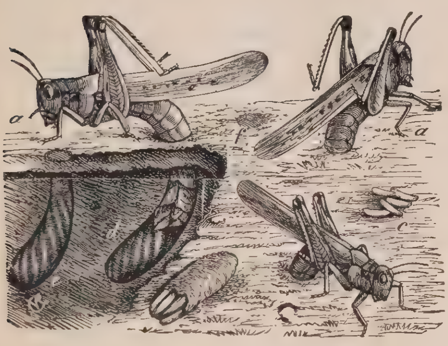


FIG. 8.—Locusts laying eggs.
(Riley.)

FIG. 9.—The Destructive Pea Aphis :
winged viviparous female—enlarged 6 times.

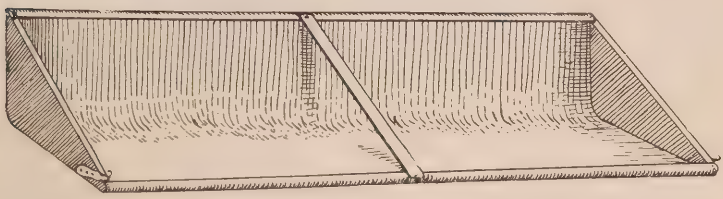


FIG. 10.—A Hopperdozer.

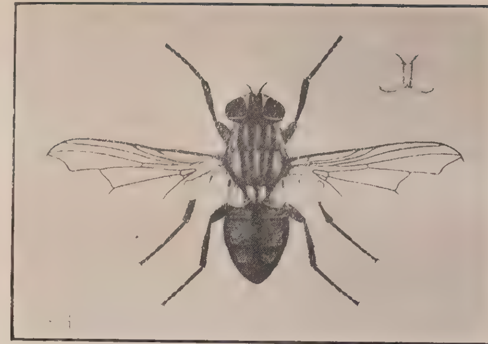


FIG. 11. The House Fly.

FIG. 12.—The Stable Fly.

FIG. 13.- The Lesser House Fly.

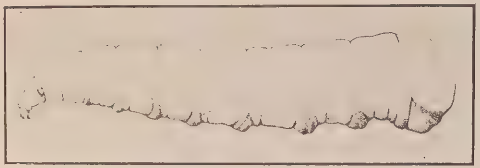


FIG. 14.– Maggot of the House Fly.

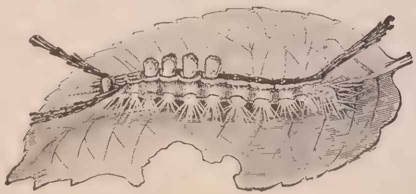


FIG. 15.—Caterpillar of White-marked Tussock Moth.

OTHER INSECT PESTS OF FRUIT.

In addition to the above insects which proved to be the most injurious during the year, outbreaks of certain other species have been reported and investigated, among which the following are worthy of record.

TENT CATERPILLARS.—Several species, the chief of which are *Malacosma americana* Harris, and the Forest Tent Caterpillar (*M. disstria* Hbn.), have been responsible for great defoliation of orchard and forest trees in the eastern provinces and in British Columbia. The eggs of the two species can be distinguished by the fact that the egg-masses, which in both cases are deposited in the form of a band round one of the smaller twigs, in the case of *M. americana* are rounded at the ends, whereas those of *M. disstria* are cut off somewhat squarely at the ends.

THE TUSSOCK MOTHS.—The White-marked Tussock Moth (*Hemerocampa leucostigma* S. & A.) was reported from Prince Edward Island, Nova Scotia and Ontario. In the latter province, it also defoliated the shade trees in certain of the larger cities. The Rusty Tussock Moth (*Notolophus antiqua* L.) was abundant in Nova Scotia and in Prince Edward Island. Both these insects appear to be subject to parasitic enemies, and their serious injuries are usually of a sporadic nature.

THE RED-HUMPED APPLE TREE CATERPILLAR (*Schizura concinna* S. & A.) was reported to be abundant in the different provinces of eastern Canada.

THE CHERRY AND PEAR SLUG (*Eriocampa cerasi* Peck.) was very common in fruit-growing regions throughout the Dominion. Most of the injury appeared to be caused by the second generation, and its results were therefore not so serious as they might have been. The Cherry-leaf Beetle (*Galerucella cavicollis* Lec.) was reported from Nova Scotia in July, and, in one instance, the injuries were so great that the crop was useless. It is a pest of the wild cherry and occasionally attacks cultivated cherries. The Currant Maggot (*Epochra canadensis* Loew) was reported from Lebret, Sask., and the Snowy-tree Cricket (*Œcanthus niveus* Serv.) injured raspberry canes in Ontario.

INSECTS INJURIOUS TO FIELD CROPS AND CEREALS.

Although one of our correspondents writing from Millwood, Man., commented on the variety of new insect pests occurring during the year, which is only to be expected as more land is annually brought under cultivation, there have been no very serious outbreaks of insects injurious to cereals reported to the Division. With the exception of White Grubs and Wireworms, which have already been discussed, the insect most seriously injurious to field crops appears to have been the Hop-flea Beetle (*Psylliodes punctulata* Melsh). In many localities in the provinces of Ontario and Quebec, grasshoppers have been the cause of considerable loss to farmers and it is unfortunate that so few, if any, of them attempt any eradicative measures but allow these insects to increase by accumulation.

THE HESSIAN FLY (*Mayetiola* (*Cecidomyia*) *destructor* Say) was reported from Ontario and also from Saskatchewan, and the Greater Wheat-stem Maggot (*Meromyza americana* Fitch) also occurred in a number of localities in Ontario. At Claresholm, Alta., the Western Wheat-stem Sawfly (*Cephus occidentalis* Riley & Marlatt), was so injurious to wheat that in certain places it was difficult to harvest it, owing to the wheat being laid flat by the breaking of the stems.

The treatment of insects injurious to cereals is by cultural methods devised in accordance with the life-history of the species in question. The most important of these methods are clean farming and the prompt destruction of volunteer crops.

In the case of the Hessian Fly and the Wheat Midge (*Diplosis tritici* Kirby) the screenings and chaff should be burnt.

LOCUSTS.—In certain regions of Ontario and Quebec the Lesser Migratory Locust (*Melanoplus atlanis* Riley) occurred in large numbers, destroying growing oats and turnips: in a number of cases turnips had been sown twice and both crops were destroyed. Mr. Gibson found the species in enormous numbers in the Baskatong region of Quebec. The same species and also the Red-legged Locust (*M. femur-rubrum* DeG.) were injurious in certain sections of Manitoba, where the Criddle mixture has proved a very effective and at the same time a simple remedy. It is made by well mixing 60 lbs. of horse droppings, 1 lb. of Paris green and two lbs. of salt in a barrel. This mixture is then carted to the edge of the field infested with the locusts which are extremely fond of horse droppings and are killed by feeding upon this poisoned bait. When the young locusts or 'hoppers' are common, they can be destroyed in large numbers by the use of a 'hopper-dozer' which consists of a long shallow and narrow tray containing water covered with coal-oil. (See illustration.) This is dragged over the infested ground and the 'hoppers' leap up on its approach and drop into the water and are killed. Attention should also be paid to the cultivation of the land that has been infested. It is found that the eggs are generally deposited on land which has been under crop, especially if it has been left as a summer-fallow. Wherever locusts have been abundant, all stubbles should be ploughed down as soon as possible and, if the summer-fallowing is adopted, it should be started early. The habit of the locusts of depositing their packets of eggs in cultivated land renders their control in this manner in a large measure possible.

THE HOP FLEA-BEETLE (*Psylliodes punctulata* Melsh).—In 1908 it was estimated that 80 per cent of the hop crop in British Columbia was destroyed by this insect and the problem, therefore, had assumed a serious character. It is not the same species as the English Hop-beetle which is *P. concinna*. On visiting the district in October, 1909, I was informed by Mr. Hulbert that the beetle had not been so serious during the year as in the previous four years. This decrease may be due to the active control measures that have been employed in the hop yards and also, to some extent, to predaceous and other enemies. The chief difficulties in controlling the insect are the rapid growth of the hops and the continued emergence of the beetle. Owing to the former circumstance, the value of spraying with arsenicals is greatly reduced by the continued production of new foliage upon which the beetles continue to feed, and the prolonged emergence of the insects provides a succession of the pests. The eggs, larvæ and pupæ occur beneath the soil at a depth of three to six inches, according to Mr. H. T. Quayle, who made observations on this insect. The larvæ feed on the roots of the hop and other plants and the adults have been found feeding upon nettle, potato, mangel, beet, turnip, dock, lamb's quarter, pigweed and red and white clover. It is of great importance to keep down wild solanaceous plants and weeds and to adopt such clean methods of cultivation as the burning of all refuse and old vines. Mr. Hulbert, (Chilliwhack, B.C.), found the following measures of value in destroying the adult beetles: smearing the stems of the vines with tanglefoot to a height of about a foot from the ground, shaking the beetles off the vines on to tarred cloths or boards held down below on the ground and also dusting off the beetles with a feather brush on to tarred boards or cloths. Deep ploughing in the fall is also to be recommended.

THE POTATO FLEA-BEETLE (*Epitrix cucumeris* Harr.) was found causing injuries to the potato crop in Prince Edward Island and in certain sections of Ontario. The use of *poisoned* Bordeaux mixture would control this insect as in the case of the common Potato Beetle (*Leptinotarsa decemlineata* Say).

In Manitoba and the west, the Red Turnip Beetle (*Entomoscelis adonidis* Fab.) was more destructive than usual, especially to garden-grown turnips. Mr. Norman

Criddle reports that he found the beetles at Aweme, Man., feeding first on the wall-flower (*Erysimum parviflorum* Nutt.) and the Worm-seed Mustard (*E. cheiranthoides* L.), later they attacked the turnips. The eggs usually hatch in the spring before the cultivated plants are available and the larvæ accordingly feed upon wild species of plants, usually belonging to the same natural order as the cultivated ones, in this case the Cruciferæ (as also is the case in the Flea-beetles). This indicates the importance of *clean cultivation and the destruction of all weeds,* upon which I have previously insisted. When farmers and fruit growers realize that in many of these insect attacks, the intensity of the attack, and often the presence of the insect, is entirely due to the presence of weeds or of wild trees belonging to the same or allied natural orders as the cultivated plants that are attacked, they will be more unwilling to have weeds growing in and around their fields and wild plums and crab apples around the hop gardens and orchards. Clean cultivation is a factor as necessary in farming and fruit-growing to combat insect pests, as clean houses and sanitary conditions are in the prevention of human diseases.

Blister Beetles.—These insects furnish an interesting example of a useful insect which at times becomes noxious. The larvæ of these beetles are useful, owing to the fact that they feed on the eggs of grasshoppers and other insects. The adult beetles, however, occasionally appear in swarms, and, by feeding on the foliage of cultivated plants, cause serious damage. They are elongate and narrow insects and, of the three species which commonly occur, two were reported as being seriously injurious. The Black Blister Beetle (*Epicauta pennsylvanica* DeG.) caused great destruction to the foliage of potatoes in the neighbourhood of Fort William and Algoma, Ont., and in Quebec. It injured potatoes in Manitoba in July and also attacked Delphinium. The Grey Blister Beetle (*E. cinerea* Först) was reported from Cowansville, Que., as attacking horse beans, potatoes and vines. As the larvæ of these beetles are beneficial, the wholesale destruction of the adult beetles is not to be recommended, but when the beetles appear they should be driven off the crops by a line of boys or men walking through the crop with branches or switches, and it is usually found that when driven thus they do not return.

Cutworms.—From year to year these insects, which are the larvæ or caterpillars of Noctuid moths, are constantly reported as inflicting damage, varying in magnitude, to different field and garden crops. Such common species as the Glassy Cutworm (*Hadena devastatrix* Brace), the Red Backed Cutworm (*Paragrotis ochrogaster* Gn.) and the Variegated Cutworm (*Peridroma saucia* Hub.) are the more destructive and were sent in from different parts of the Dominion. The methods which are used in preventing cutworm injuries are: (1) the placing of small metal cylinders round the plants; (2) surrounding the bases of the plants with poisoned bran, prepared by mixing half a pound of Paris green with fifty pounds of slightly moistened bran, and to each gallon of water used in moistening the bran, half a pound of sugar is added; (3) when the cutworms are attacking a crop they can be destroyed by the use of poisoned bait in the following manner: a small patch of clover is well sprayed with an arsenical poison (1 pound of Paris green to 150 gallons of water, or 6 pounds of lead arsenate to 100 gallons of water), it is then cut and the poisoned vegetation is distributed in small heaps around the infested crop, a small board or shingle being placed on the top of each heap to conserve the moisture.

A large variety of insects attacking field crops, vegetables and roots, in addition to those that have already been mentioned, were reported to the Division. The Pea Aphis (*Nectarophora pisi* Kalt) was destructive in certain parts of Quebec and Ontario from July to September. It was found that the small hymenopterous parasite (*Megorismus fletcheri* Crawford), was responsible for the reduction in the numbers of this aphis; parasites emerged on September 15 from aphids collected on September

2. The most satisfactory method which has been found of controlling this insect is that of brushing the aphids off the plants by means of switches and following this up with a cultivator; by these means the aphids are swept off the plants and their return rendered impossible. A special machine for this purpose has been manufactured. The Pea Weevil (*Bruchus pisorum* L.), which has been increasing in abundance during the past few years, was reported from Quebec and also from Ontario where it is more prevalent in the western counties. Farmers are beginning to realize that this insect can be controlled by the fumigation of the seed peas with carbon bisulphide, and it remains for them and other growers to co-operate and secure the fumigation of all infested peas. In such a manner, the weevil could be eradicated from any locality in which it now occurs and at little expense. In certain of the counties of New Brunswick and Nova Scotia the Carrot Rust-fly (*Psila rosæ* Fab.) was responsible for considerable injury to carrots, especially by the maggots of the later broods infesting the stored roots. When the insect occurs in the stored roots, it can be destroyed by fumigation with carbon bisulphide in air-tight receptacles, using 1 to 2 ounces of this chemical to 100 pounds of roots. Where they are attacking the growing carrots, it is even more difficult to apply remedies than in the case of root maggots. It is sometimes advisable to sow as late as possible and thus escape the egg-laying of the flies.

Aphides attacking turnips, cabbages and potatoes were as abundant as those previously described on trees, and probably for the same reasons.

INSECTS INJURIOUS TO FOREST AND SHADE TREES.

Of all injurious insects, these are the most abundant, but the attention that is paid to them is not in proportion to their abundance or importance. Nevertheless, as our forests become annually more valuable as national assets and the shade trees in our cities and towns increase in importance and value in like manner, it becomes more and more essential to conserve these possessions, the value of which is not always sufficiently realized. The formation of forest reserves and of national parks and the improvement of our cities, all these activities necessitate the devotion of greater care to the control of forest and shade tree insects and to the discovery of means to prevent the annual destruction of millions of trees, which goes on at present.

THE LARCH SAWFLY.—The most serious forest insect at present is the Larch Sawfly (*Nematus erichsonii* Hartig.) which is destroying, and has already caused the death of the greater portion of the larches or tamaracks throughout eastern Canada from Nova Scotia almost to Winnipeg. It is repeating the history of the outbreak in 1882-85, when it destroyed practically all the mature larches through this region and the only means of control for a forest insect occurring on so large a scale are its starvation by the killing of its food plant, which repeated annual defoliation is bringing about, and the increase of its natural parasites, which is indicated by observations that we are now making. Fortunately, as timber, the tamarack is not so valuable in Canada as yet, but the gradual exhaustion of the timber supply will increase the value of this tree which is so well adapted for growing in rough and muskeg country, and its collective value as a forest tree should not be lost sight of. The Sawfly was not found west of the Rocky Mountains where the western species of larch is fairly common. It is interesting to note its marked preference for the European larch. A study of this insect and its insect and fungal parasites of both this continent and in Europe is being made.

THE SPRUCE BUD-WORM.—In July, the Hon. W. C. Edwards reported that an insect was causing much damage to spruce and balsam in the Upper Gatineau region about 100 miles north of Ottawa. Mr. Gibson visited the infested region and, on examination, found that the injuries were caused by a lepidop-

terous larva known as the Spruce Bud-worm (*Tortrix fumiferana* Clemens). He reported that thousands of empty chrysalids were found on the trees where the caterpillars had been feeding. The enormous numbers of the brownish-red chrysalids, together with the larval excrement and loose, partly-eaten and discoloured foliage gave the conspicuous reddish appearance to the tops of the trees. Beyond the loss of the foliage of the upper portions of the trees, they were not seriously injured. The foliage for about four or five feet from the tops of the trees was almost wholly destroyed. The moths were seen at the time of the visit on July 29 and also on the Central Experimental Farm. The infestation was of a wide nature, occurring not only in Quebec but in the maritime provinces. It was also reported on July 14 from British Columbia by Mr. J. R. Anderson, for whose reports on different insects from time to time we are greatly indebted, as they are of great value to us. In Victoria, B.C., the moths occurred in enormous numbers and the same abundance was reported by Mr. Hanham, of Duncans, B.C. This species was recorded by Dr. Fletcher in his report as Entomologist for 1885, in which year it was reported from Quebec and from New Brunswick and he believed, as I also believe from evidence recently collected, that the damage to spruce in eastern Canada is not entirely due to this insect. In many instances it is no doubt the work of the Bark-boring Beetle (*Dendroctonus piceaperda* Hopk.). The seriousness of the attacks of the Spruce Bud-worm is due chiefly to the fact that it attacks the buds which, in such a slow-growing tree, affects the growth considerably and repeated attacks will kill the tree. When visiting Vancouver Island in October, I learnt that the infestation was increasing and found that the insect was attacking mainly the Douglas Fir (*Pseudotsuga mucronata* Raf.) Sudw. In some ornamental grounds, it was also found that it had been feeding on larch, silver fir, Norway spruce, deodar and African cedar. Dr. Fletcher also found it attacking spruce trees in Manitoba in 1907.

The eggs are laid on the leaves towards the end of July and the young larvæ are pale green. The winter is passed in the larval stage and, when the larvæ continue to feed in the following year, they construct for themselves shelters by binding together the loose leaves or needles. When full grown, which is about the end of June, they are of a reddish brown colour and they pupate in the loosely made shelters, emerging from the pupæ about the middle of July. It was found in British Columbia that the spread of the moth had been in the direction of the prevailing winds, as the moths are very easily carried by the wind.

Bark Beetles.—Several species of bark beetles were reported as causing serious damage to coniferous trees, and it is evident that the destruction of much of the timber in Canada which is attributed to fire and other causes is in no small part due to the work of bark-boring beetles, many species of which attack the strong and healthy trees and by boring through the growth layer retard and prevent the growth of the tree, which, weakened in vitality, is then liable to the attacks of various other species; when finally killed, the timber is attacked by the timber-boring beetles. Trees weakened by fire are susceptible to the attacks of a large number of species of these beetles which are not infrequently responsible for the final destruction of large areas of fire-swept forest. It is of the greatest importance to recognize the attacks of forest pests in the earliest stages when there is often hope of control. Later, when the infestation has reached some magnitude, such hope must be abandoned as a rule.

The Eastern Spruce Beetle (*Dendroctonus piceaparda* Hopk.).—Portions of spruce trees, killed and dying, were received from Cape Breton, Nova Scotia, and they proved to be seriously infested with this species, which was also reported from Digby county, Nova Scotia, and New Brunswick. Dr. Fletcher recorded this species, under the specific name of *rufipennis*, in his report for 1887, as injurious in the Eastern Townships of Quebec. The small reddish brown to black beetles usually emerge about June and boring into the bark they excavate galleries along the sides of which the

eggs are deposited. On hatching, the larvæ feed on the soft lower layers of the bark and form galleries running from the central egg gallery. The early-hatched larvæ are fully grown about August and they change into pupæ and later into mature beetles which hibernate in the larval burrows until the spring. If the trees are barked during the hibernating season they may be felled later, or they may be felled at once, but felling is the only method to be employed in the control of this insect.

From Almonte, Ont., a bark beetle which appeared to be the Black Turpentine Beetle (*Dendroctonus tenebrans* Oliv.) was reported. In this locality many of the balsam and cedar and some pine and spruce trees were dead and other pines were dying. Beetles were taken from tree roots of 15 to 18 inches in diameter and they were very numerous in the underground portion of the tree. This appears to be somewhat northerly for the distribution of this insect. A species of bark boring beetle injuring pines near Lake Joseph, Muskoka, was reported, but no specimens were received.

The Bronze Birch Borer (*Agrilus anxius* Gory).—A large number of the cut-leaved birches on the grounds of the Central Experimental Farm, Ottawa, and in the neighbourhood, were found to be dying off at the tops, and on examination it was discovered that the death of the branches was due to the larvæ of this most destructive insect. The 'flat-headed' boring larvæ were found boring their way in winding and zig-zag burrows through the sap wood, and in some cases the borings extended to the centre of the branch. Branches and twigs of all thicknesses were attacked. This species is under observation, but the available evidence and that of other investigators, notably Slingerland, indicates that once a tree is attacked there is no possible method of eradicating or controlling the insect and the immediate felling and burning of such trees to prevent the dissemination of the insect is necessary.

The Ribbed Rhagium (*Rhagium lineatum* Oliv.).—Adults of this species were found in their characteristic pupal cells on March 3, together with the white broad-headed larvæ under the bark of spruce trees killed in Nova Scotia by *Dendroctonus piceaperda* Hopk. Packard and Felt record this species as being common on pine, for which reason it is called the Ribbed Pine-borer by the latter. Cavities are formed by its boring underneath the bark, and these are usually found filled with frass. These excavations loosen the bark and cause it to fall away. As mature beetles and larvæ occurred together in March, this species evidently passes the winter in Canada in both these stages.

The Birch Leaf-mining Sawfly (*Phlebatrophia mathesoni* MacGillivray).—This insect, for which the above common name is proposed to distinguish it from the leaf-mining Tineid caterpillars, is of interest scientifically as it is a species that has been present in Nova Scotia for about five years and was not described until about October, 1909, when Dr. MacGillivray described it in the *Canadian Entomologist* of that month (pp. 345 and 346) creating a new genus for it. Its attacks during the year have been very severe in Nova Scotia, the birch leaves appearing brown and withered as if the trees had been killed; in consequence, some alarm was created. The larva is a small worm which bores and mines inside the tissue of the leaf and by destroying all the green living tissue of the leaf produces the brown and dead appearance. About the time the leaves are ready to fall, the larva, according to Prof. H. W. Smith, 'spins a circular nest in the mine it has made,' and in this it passes the winter, and, as is the case with a number of the sawflies, it pupates in the spring, emerging shortly afterwards as a small black sawfly. It is not unlikely that the injuries of this leaf-mining sawfly have been mistaken for those of the Birch Skeletonizer (*Bucculatrix canadensisella* Chambers), which is also common in the provinces of New Brunswick and Nova Scotia and was reported during the year from Kings and Digby counties, N.S. The White-marked Tussock Moth (*Hemerocampa leucostigma* S. &

A.) was again injurious to shade trees in certain of the cities, notably Toronto and Hamilton. This species can be controlled by careful and systematic spraying with lead arsenate in the summer and by the destruction by means of creosote or the removal of the egg masses which are readily found in the winter. The Green-striped Maple Worm (*Anisota rubicunda* Fabr.) was reported from Bryer, Que., where it was defoliating sugar maples. The attack was more extensive during the past year than in 1908, and the injured trees were stated to yield much less sugar than the uninjured. This species also feeds on the soft maple. In the Eastern States it does not often occur in sufficiently large numbers to cause any serious damage, but is more injurious in the western states according to Felt. The Midrib Gall (*Cecidomyia negundinis* Gill.) was very abundant on the Manitoba maple in Manitoba and Saskatchewan. At Alexander, Man., a correspondent reported that a windbreak of about 2,000 young Manitoba maple trees were badly infested with this insect.

INSECTS INJURIOUS IN GARDEN AND GREENHOUSE.

In addition to certain of the insects, to which reference has already been made, a certain number of species injurious to plants in gardens and greenhouses, were received. Species of Thrips were injuring asters (Ontario) and roses (British Columbia). At Indian Head a species of *Aleyrodes* or 'White Fly' was destroying fuschias and these insects were also reported from Ontario and Quebec.

In Toronto, asters were destroyed by Aphides or plant lice which were found on their roots. These aphides appear to be placed in such situations by ants, which cultivate them to obtain their excretions of 'honey dew,' and ants are usually found in association with such root aphides. Where root aphides are found in association with ants, the treatment discovered by Prof. S. A. Forbes to prevent the appearance of the Corn-root Aphis (*Aphis maidi-radicis*, Forbes) may be of use and might be tried. A mixture is made of one gallon of wood alcohol and a pint of oil of lemon. If a few drops of this are placed in the soil near the roots of the plants the ants being repelled by the odour may not take the aphides to such roots as are protected. Diaspine, *Lecanium* and *Eulecanium* scales were sent in to the Division having been found upon greenhouse plants, and in all cases it was found that kerosene emulsion removed them readily.

HOUSEHOLD INSECTS.

THE HOUSE FLY (*Musca domestica* L.) (Fig. 11).—While this is the commonest household insect it is at the same time the most dangerous; not on account of its destruction of household effects, but owing to its habits which make it one of the most serious carriers of the germs of such diseases as typhoid fever, tuberculosis, infantile diarrhœa, &c., wherever flies occur in large numbers. No fly is free from germs, but all carry about the spores of moulds and bacteria and this is due to their habit of frequenting decaying substances and excrementous products for the purpose of depositing their eggs. Each female fly lays from 120-150 eggs at a time and one fly may lay six or more such batches of eggs during a single season. These eggs are deposited on any kind of decaying vegetable matter, such as kitchen refuse, &c., or on excrement. The chief substance in which flies are bred is horse manure, and wherever there are exposed heaps of horse manure flies will be present in very large numbers. From the small sausage-shaped white eggs, the maggot emerges and in a few days, if the weather is warm, it becomes full grown (Fig. 14) and changes into a brown puparium from which the fly emerges. The whole development may be complete in 9 or 10 days, or even less in very hot weather, and these flies which emerge are able to begin to lay in about a fortnight, so that the production of enormous numbers of flies is readily understood.

Owing to their serious and important relation to health, it is of the greatest importance to prevent flies from breeding, and this can be accomplished best by several means. No manure heaps should be left exposed within half a mile of dwelling houses for more than seven days. They should be removed within that time, and if possible the manure should be spread on the ground. This periodic removal applies especially to manure heaps in towns. Garbage tins in which flies frequently breed should be kept constantly covered and emptied at least once a week, and all such waste vegetable matter should be burnt. Great care and attention should be paid to the keeping in order of privies; soil or ashes should always be used, as such places, if not kept perfectly sanitary and all excrement covered, will serve, not only as breeding places, but also as possible sources of infection of disease. Where sanitary conditions and cleanliness prevail house flies will not be abundant, but where unsanitary conditions, exposed manure heaps, open garbage tins and heaps of decaying substances are found, house flies will abound in their myriads. To the farmer, care with regard to this insect is especially important, owing to danger of their infecting milk. In and about cow-sheds, where flies are common, the milk in pails should be screened with muslin as such flies are heavily infected with bacteria.

THE STABLE FLY (*Stomoxys calcitrans* L.) Fig. 12.—This species is common in Canada, especially in the fall. It normally occurs out of doors or in cowsheds and stables, but sometimes enters houses, and as it is a biting or blood-sucking species, it not infrequently bites man. Its general similarity of appearance to the common house fly is responsible for the idea that house flies bite, which is incorrect, as they are unable, by the structure of their probosces, even so much as to pierce the tenderest skins. It will be found that these so-called biting house flies are almost invariably *Stomoxys calcitrans,* which normally feeds on the blood of cattle. The larvæ or maggots have a similar appearance to the maggot of the house fly, and they breed chiefly in decaying and fermenting vegetable matter and excrement.

THE CROTON BUG OR COCKROACH (*Ectobia germanica* L.)—This has been reported from many localities as being a very serious pest in houses. It is light brown in colour and has two dark lines on the thorax; it measures about three-fourths of an inch in length. These insects are more than usually difficult to destroy, as they appear to be gifted with special intelligence and to be able to detect that a substance is poisoned. Houses should be kept clean, and all cracks that it is possible to fill should be filled. It has been found that a mixture of borax and sugar is effective as a poison. The painting of all the crevices and likely haunts with a dilute solution of formalin or formaldehyde (formaldehyde is a liquid that can be obtained from the drug store; to one part of this liquid, which should be 40 per cent solution, 10 parts of water are added to make a dilute solution) may be found effectual in eliminating them from a house. A very dilute solution of corrosive sublimate (which is poison) painted in the same manner may have the same effect. There are a number of roach-killing preparations on the market, some of which have a fatal effect on these insects.

ANTS.—These common household pests were reported frequently to the Division, and the small red ant. (*Monomorium pharaonis* Linn.) was, apparently, the worst offender. When they occur in large numbers their destruction is difficult. The first essential is to discover their nests, or the situation of such nests, and, having done so, a small quantity of carbon bisulphide should be injected. This solution (which is highly inflammable) volatilizes and the vapour is highly poisonous to insect life. The same treatment may be adopted in the case of ants occurring in large numbers in the garden; their nests should be found and the carbon bisulphide poured into holes made by means of a small stick. Coal oil or kerosene is also effective when poured into the nests of the ants.

THE CARPET BEETLE (*Anthrenus scrophulariæ* L.)—This insect, sometimes known as the Buffalo Carpet Beetle, has been frequently reported as injuring carpets, large numbers of the larvæ or grubs being found round the edges of carpets; it also destroyed woollen goods and furs. The adult insect is a small stout beetle, (see illustration), measuring about one-eight of an inch long and strikingly coloured, having the wing covers coloured black, yellowish-white and red, the red markings forming a line down the middle of the back from which three branches are given off on each side. The larva or grub measures one-eight of an inch in length and its body is covered with groups of hairs. The beetles are common on flowers about June and not infrequently are carried into houses on flowers. In the house they deposit their eggs on the carpets and similar material, and the small hairy larvæ then feed on the same.

Carpets and materials badly infested with the beetle should be cleaned and afterwards treated with benzine (out of doors). If the attack is not great, they can be destroyed by laying a damp cloth over the infested portion and ironing with a hot iron; the hot steam that is generated is fatal to the grubs. The floors should be scrubbed with boiling water. When the carpets are laid, it has been found that the laying of tarred paper in strips about one or two feet wide beneath the carpet, around its edge, will prevent the beetles to some extent from laying their eggs on such carpets.

MITES AND OTHER PESTS.

A number of small creatures which are not insects, although they are classed very frequently with insects, are responsible for injuries to vegetation of different kinds. A large number of these belong to the Arachnids or Spider family, which are characterized by the possession of four pairs of legs instead of three pairs such as the typical insect possesses. This family includes all the mites, red spiders and ticks. In addition to these, the members of another family, of which the millipede is an example, often attack growing vegetables and other crops; cases of such were reported from Ontario and Nova Scotia.

The following were some of the more important of these pests which were reported to the Division:—

THE PEAR-LEAF BLISTER MITE (*Eriophyes pyri* Nalepa).—This mite, which appears to have been introduced into Canada on nursery stock from Europe, is becoming more serious annually. It was found throughout the Dominion, from Nova Scotia to British Columbia, being very bad in certain localities in the latter province. It will attack, not only the leaves of pear but also the young fruit, and the leaves of the apple. Early in the year, when the leaves are first attacked, they appear to be covered with bright red spots and swellings, which are most numerous near the centre of the leaf. Later these spots turn green, and finally brownish-black as the leaves become older and mature. These small spots or tubercles contain the mites, and are galls formed by the young mites entering the breathing pores or stomata of the leaves and feeding on the leaf tissue. The female measures less than one-hundredth of an inch in length. When they are full grown, they deposit their eggs in the galls, and the young mites, hatching out, leave the gall and seek new stomata, and in this manner form fresh galls. The mites pass the winter under the bud scales, especially those of the terminal buds, where they may be found in small colonies. The mites of this group are difficult to eradicate, and the best means that can be suggested is the thorough spraying of the trees, especially the buds, with lime-sulphur. This should be applied in the fall or as late as possible in the spring, shortly before the buds swell.

The mites belonging to this class, the Eriophyidæ, are common on shade trees, and a number of species of *Eriophyes* were reported as causing injury. A species on ash and elm was stated to have caused the loss of several fine specimens of these trees in Quebec. In Ontario, maples were severely infested by another species.

THE APIARY.

Mr. D. D. Gray, who superintends the apiary, reports to me as follows on the wintering of the bees:—

WINTERING.

Thirty-eight colonies were put into the bee-cellar on November 18, 1909. In preparing them for the winter, air was given at both the top and bottom of the hive, each hive being raised from the bottom board about one inch. The cover was removed and replaced by two or three brown sacks. They wintered very well and no colonies were lost. They were taken out of the cellar and put on the summer stands on March 31.

The average weight of the colonies, when put into the cellar, was 46·27 pounds.

The average weight of the colonies, when put on the summer stands, was 36·65 pounds.

The average loss per colony during winter was 9·62 pounds.

The greatest loss for a single hive during the winter was 12 pounds, and the smallest loss 8 pounds. The colonies weighed from 40 to 57 pounds on entering the cellar, and 30 to 48 pounds when placed on the summer stands.

Two colonies, whose average weight was 48 pounds, were wintered in the same state as when taken off the stands; no attention being paid to ventilation. The average loss during the winter was 12 pounds. The bees did not appear to be contented, keeping down at the bottom of the hive, and many died during the winter. With the construction of a cellar in which the heat and ventilation can be regulated, together with the careful ventilation of the hives, the problem of wintering appears to be solved so far as is possible.

Mr. C. A. Burnside has carried on the practical work in the apiary, and to him and to Mr. Gray, whose careful attention to the wintering bees in the cellar is responsible for the excellent condition in which they were put on the summer stands, all credit is due.

REPORT OF THE DOMINION BOTANIST

(H. T. GÜSSOW.)

OTTAWA, March 31, 1910.

DR. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit my report on the work of the Division of Botany from April 1, 1909, to March 31, 1910. The report includes some account of the work carried on before I took up my duties in Canada in July, 1909, which was obtained from the records kept in the Division. In taking charge of the Botanical Division, it was important to equip the laboratories and also to form a library composed of standard books of reference and of periodicals, by which means much time and outside consultation would be saved. Owing to the fact that the work of the Division of Botany was hitherto included in the former Division of Entomology and Botany and to the further fact that my predecessor, the late Dr. James Fletcher, devoted most of his time to entomological studies, the laboratories of the new Division of Botany naturally lacked instruments and apparatus for this new and special work. Much time was spent in selecting and ordering the necessary apparatus and literature, and late in the year sufficient was obtained to equip the rooms available and fit them up for use. I am now able to report that the laboratories of the Division are in good working order and that they are satisfactorily equipped with modern scientific apparatus and recent literature. Unfortunately, the space provided for this purpose which at the same time serves as offices for a large amount of executive work and for the accommodation of the Division's Herbarium is rather limited. In connection with the equipment of the laboratories, I paid a visit to Washington, D.C., to become acquainted with the apparatus most commonly in use in the laboratories of the United States Department of Agriculture and with the sources of their supply. This visit was found very instructive and certainly saved time and expense in obtaining here most of the equipment required. In supplying the laboratories, special attention was paid to the requirements for the work involved in carrying out investigations on diseases of plants due to micro-organisms as bacteria and fungi.

Considering the vast extent of the Dominion and the differences in soil and climate, it is most important to establish a centre for investigation of the diseases of plants which annually cause enormous losses to the growers of fruit and farm crops in Canada. Without the co-operation of the fruit growers and farmers, this work will make slow progress, and I earnestly hope that we may rely on the assistance of all concerned in order to render our work generally useful. I am glad to be able to report that the special attention which has been paid to the question of diseases in plants has already shown some results in the timely discovery of the noxious disease of potatoes known as 'Potato Canker,' which made its first appearance on this side of the Atlantic in Newfoundland. So far I have not been able to discover the disease in Canada, and I will not take up time giving further details here, but would refer all who desire fuller particulars to Bulletin 63 of the Central Experimental Farm, which fully describes this disease.

During the past year I have investigated a considerable number of the diseases affecting the grain, fruit, vegetable and farm crops generally, an account of some of which will be found in this report. I have endeavoured to describe the commonest diseases, like pear and apple scab, potato blight, &c., fully, having recognized how little is really known regarding the nature of the diseases and the remedies for their control by some farmers and fruit growers. The results of personal investigation of these diseases as they occur in Canada, together with careful directions against their spreading, will establish a useful record from year to year and will be found of increasing value as time goes on. We shall be glad to examine these diseases under all conditions, as they may behave very differently in various localities, and their treatment may differ considerably from that suggested for the prevention of the same diseases occurring in neighbouring or in European countries.

In addition to this work, much of my own and my assistant's time was occupied in the determination of the large number of plants sent for identification from all parts of the Dominion. It is my very pleasant duty to record the painstaking work and able help rendered me by my assistant, Mr. Herbert Groh, B.S.A. His untiring and reliable work, gladly and often rendered after office hours, has been very encouraging to me.

Considerable additions have been made to the Herbarium of the Division.

The experimental plots which were in existence at the Farm are being continued; some new land has been set apart for experiments on potato scab and other diseases of farm crops. The yield of the plots, occupied by the more useful plants found in Canada and imported from other countries likely to prove of value here, have been carefully recorded. In future it is the intention to extend the trial of fodder grasses to other parts of the Dominion, as in some localities such plants as have been of little value here may be found of use elsewhere.

During the year I paid several visits to farms in the neighbourhood of Ottawa, in the Niagara district and other places where advice was required concerning the extermination of weeds or the prevention of diseases; I also gave addresses at farmers' meetings and appeared before the Select Standing Committee on Agriculture and Colonization to give evidence. In December last I attended and contributed a paper to the meeting of the American Association for the Advancement of Science held at Boston.

I have the honour to be, sir,

Your obedient servant,

H. T. GÜSSOW,

Dominion Botanist.

GENERAL DIRECTIONS REGARDING THE DISSEMINATION AND CONTROL OF PLANT DISEASES.

The term 'plant diseases' is, generally speaking, applied to injuries to vegetation which are caused by more or less minute parasitic organisms belonging to the lowest orders of the vegetable kingdom, as Fungi and Bacteria. These parasitic organisms are capable of destroying living tissues of plants from which they derive all the food necessary for their development. Owing to the absence of chlorophyll or green colouring matter they are incapable of manufacturing their own food, as is, with the exception of a few, the case in plants that possess chlorophyll. Accordingly, the more severely vegetation is attacked by parasites, the more pronounced is likely to be the injury. To check these injuries, involving often considerable loss, and sometimes destruction of the whole crop, it has been the task of the plant pathologist to acquaint himself with the life histories of the parasitic organisms in order to discover the most practicable means to prevent the spread of these injuries. As regards the cure of diseases, *i.e.*, to restore a diseased plant by means of suitable treatment to its former healthy condition, we may state and we believe that every conscientious worker in plant pathology will agree that it cannot be claimed that suggestions in this direction have proved of the slightest value. Though timely treatment may prevent the further growth of the diseased plant from being attacked, yet in many cases the seat of the injury cannot be reached by our present methods of prevention and the plant generally succumbs. Hence, taking this unfortunate state of affairs into consideration, we must concentrate our efforts to prevent disease germs from attacking plants at all. Our knowledge of the disease-causing organisms has advanced step by step, and the careful study of their life histories has resulted in discovering precautions, which if universally acted upon would considerably reduce the losses from this cause. It must be emphasized that co-operative effort will probably produce these desirable conditions. It is of little use if one man only does all he can to restrict disease on his land, when his neighbour is too negligent to join in this important work. The prevention of plant diseases may be dealt with under five separate divisions, namely:—

(*a*) Practice clean cultivation in field and orchard.

(*b*) Make spraying a uniform practice.

(*c*) Practice judicious rotation of crops.

(*d*) Start with good, sound 'seed.'

(*e*) Watch for the first outbreak of diseases and apply immediately for help. Prompt and timely action may yet save the crop.

CLEAN CULTIVATION IN FIELD AND ORCHARD.

(a) Work on the Farm.

The reappearance year after year of many diseases affecting farm crops is, to a large extent, due to negligence in cleaning fields of rubbish of all kinds after harvest of any kind of crop, especially in collecting diseased parts of plants that may be scattered about. Fungi, which before harvest had the whole crop to revel in, suddenly find themselves restricted to very little available food and thus are forced to preserve their own existence by producing their resting stages or spores on any kind of herbage, dead or living, likely to carry them through the winter. On grainfields, the stubbles are left, and the field is strewn over with loose straws. We may here not only discover the winter stages of rust fungi, of grain mildew, but also many obnoxious in-

sects and weeds. On turnip or potato fields, we find roots that are damaged by the implements used in digging them up, leaves and haulms are scattered all over the field and, where club root or late blight was present, we are sure to discover on examination signs of these diseases everywhere. These few examples may serve to indicate how diseases are carried over from crop to crop. There are many farms where sheep or cattle are turned into the fields after harvest to eat up 'anything that may be left,' or where the rubbish is simply left lying on the ground in the belief that frost and snow will get rid of it and thus clear the field and save the farmer the trouble. These are not satisfactory practices. The spores by which fungi reproduce themselves may pass through the bodies of animals without losing their power of germination, or they may experience long periods of severe frost without being killed. The animals, indeed, may serve as a means of polluting other fields by their droppings containing living disease organisms. The only common-sense way of proceeding is to immediately after harvest destroy all rubbish, leaves, haulms, stubble, &c., by fire. This would kill far more dangerous fungi and insects than could be reached by other means. In all cases ploughing should follow the thorough cleaning up of fields. Not only will such measures be beneficial as regards the destruction of plant pests of all kinds, but it will also destroy many young plants of weeds.

(b) WORK IN ORCHARDS.

What has been said on cleaning fields applies also to land occupied by fruit or vegetables. Do not allow cabbage stalks, pea or bean straw, &c., to lie on the ground, but burn it up. Fruit trees require special attention. Scores of fungi hibernate on leaves that may remain on the trees or that have fallen to the ground; they also produce their resting or winter stages on dead branches still on the trees. 'Plum Pockets' do not drop to the ground but remain a source of infection on the tree. Fire blight, apple and pear scab, and most of our orchard enemies are known to pass the winter on many kinds of rubbish, dead-wood, &c., lying about. Thus, after the fruit harvest, proceed to remove, first of all, any dead twigs and branches, scrape off rough patches on bark, cut out canker spots and do general cleaning up work. All dead limbs should be cut to the fresh wood and the wounds should be painted with coal tar or white lead to protect the surfaces from infection. After pruning the trees, collect all brushwood and burn it on some open place; collect also any decayed fruit and leaves and destroy by fire.

Where conditions do not permit of the destruction of dead fruits and fallen leaves by fire, we recommend that these be collected in heaps and mixed with a quantity of unslaked lime. The heaps should be shovelled over from time to time until the lime has slaked. The action of the lime is to destroy any fungi growing on the vegetation; such fungi, if left undisturbed, would be liable to propagate their respective diseases. About one barrel of lime mixed with two cart loads of rubbish would be a sufficient quantity.

SPRAYING.

After fields and orchards are cleaned in this manner, another important step should be taken. In fields, of course, no spraying need be practised in the fall, but orchard trees and shrubs should be well sprayed to prevent diseases in the coming season. We here suggest a system of spraying which if carried out judiciously, would repay the expense and labour many times over. But before explaining what kinds of sprays are to be used, please bear in mind the following common-sense suggestions. It is not advisable to spray trees in foliage when the sun is shining. Never spray during or immediately after rain before the trees are dry. Never spray when rain is expected. Spray early in the morning or after sunset and no injurious results will occur

The spraying solution best suited for use in fall is the lime-sulphur wash. The following formula is recommended in preparing this fungicide:—

Flowers of sulphur..	15 lbs.
Stone lime..	20 lbs.
Water..	45 Imperial gallons.

Weigh out the quantity of lime, which should be fresh, place in a wooden barrel and pour six gallons of water on it. Then add the sulphur, avoiding any lumps being formed, and slake the lime slowly. Stir occasionally and add more water. The heat which will develop in slaking is sufficient to self-boil the mixture. When the lime is all slaked, cool quickly by adding water up to 45 Imperial gallons.

The greater the pressure with which the solution is forced through the nozzle of the spraying apparatus the finer will be the spray and the more economical its use. Never drench your trees, but apply the spraying solutions thoroughly in the form of fine mist.

In the following spring, the trees must again be sprayed about a week or two before the buds burst. The same spraying solution should be employed. As soon as all the leaves have unfolded, the trees should be sprayed with Bordeaux mixture. This spray is intended to cover all foliage with the fungicide and thus prevent their being attacked by fungi. By adding to this mixture some insect poison like arsenate of lead or Paris green, thus preparing a so-called poisoned Bordeaux mixture, leaves may be protected from many injurious insects also. *(Vide Entomologist's Report.)*

PREPARING BORDEAUX MIXTURE.

Four pounds of sulphate of copper should be powdered and tied up in a muslin bag; this to be immersed in a barrel containing 20 Imperial gallons of water until contents are dissolved. Four pounds of stone lime (fresh) should be broken into small pieces and be slaked with a small quantity of water until a fairly stiffish paste is produced. This paste should be dissolved in a separate barrel in another 20 Imperial gallons of water. To mix these two separate solutions, a barrel holding more than 40 Imperial gallons should be employed. The separate solutions of sulphate of copper and lime should be poured slowly and simultaneously into the barrel, the mixture being well stirred at the same time.

Correctly-made Bordeaux mixture should be of bluish colour, slightly cloudy. To test the mixture, fill a tumbler from the large barrel after stirring the mixture and set it aside to settle. After standing some time, there will be a sediment at the bottom of the tumbler, but the liquid should be as clear as water. When the liquid appears greenish-blue, it is an indication that the lime employed was too old and a little more should be added.

NOTE.—This mixture, which is properly a 2 per cent solution, is commonly known as 4:4:40 solution of Bordeaux mixture. Weaker solutions are often needed and are readily made up by diluting the stronger solution to half or even one-quarter strength as desired.

When using Bordeaux mixture, it must be borne in mind that, preferably, fresh-mixed solutions should be employed which are to be kept stirred during the act of spraying. Employ only such spraying apparatus as produces a very fine spray without clogging the nozzle. The spray, in the form of a mist, should reach every part of the tree.

A weaker solution of three-quarter strength (3:3:40) of Bordeaux mixture should thereafter be applied as soon as the petals of the flowers have fallen and one of half strength (2:2:40) employed about two to three weeks later. By means of these successive sprayings following the cleaning of the orchard, very few fungi will appear, and under normal circumstances the trees in the orchard will remain healthy.

When these suggestions have been carefully carried out, there will be less work necessary in subsequent years in scraping and locally treating diseased branches. We repeat here that success in spraying cannot be expected if the spray is washed off by rain immediately after application. In such a case, spraying has to be repeated. We are aware of the labour and cost such treatment involves, but the cost, it has been shown, will be largely repaid at harvest time. In spraying with Bordeaux mixture the growers must be cautioned. Some plants like peaches, apricots and grape vines are often injured by this solution. Peach trees should never be sprayed with Bordeaux mixture of full strength after the buds have opened, and preferably only a solution of half strength (2:2:40) should be employed.

CROP ROTATION AS A MEANS OF PREVENTING THE REAPPEARANCE OF PLANT DISEASES.

While short rotation has proved beneficial in keeping down weeds, a four course rotation or even a longer interval sometimes becomes necessary on land where a diseased crop has been raised. The destruction of rubbish and any portions of a diseased crop may be regarded as the first step towards the extermination of disease. It is, however, safer not to follow closely with the same kind of crop on land that was infested, otherwise the good results of the cleaning of such fields may be rendered useless. It is not proposed to suggest here any particular system of rotation, but it should always be remembered that a field once infested with the germs of disease is likely to be polluted for a long period.

THE USE OF GOOD SOUND 'SEED.'

The term 'seed' is here intended to include potatoes. There are many diseases of vegetables like bean spot, anthracnose, &c., caused by the use of unsound seed. The use of smutted wheat or oats for seed is an equally bad practice. It has often been shown elsewhere that the very best seeds obtainable are the cheapest in the long run. The same may be said of the use of seed potatoes. Whatever trouble may have been taken to eliminate disease from one's fields and to select new fields, these precautions are of little effect when unsound or infested 'seed' is planted. It is frequently urged that spraying increases the cost and labour; farmers should, therefore, exercise care in buying the best kind of seed so as to lessen the labour of spraying. The farmer often buys the cheapest seed, and may thus contaminate his field with diseases and weeds introduced by these means. Smutted grain, potatoes showing discolorations externally or internally are better excluded from use as seed on the farm. Some seasons, however, it may not be possible to obtain faultless seed of the needed kind. The seed should then, before sowing, be subjected to treatment which will be explained in the following pages dealing with specific diseases against which such measures may be recommended.

WATCH FOR THE FIRST SIGNS OF DISEASE.

We would advise the farmers and fruit-growers of this country to be constantly on the alert for any disease appearing. Diseases very rarely attack the whole crop without preliminary signs and great losses may be averted by timely advice. As soon as any unsound condition of crops becomes noticeable, specimens should be sent without delay to the Division of Botany for examination and report. We will do our utmost to promptly deal with inquiries of this nature, but we expect to be helped in coming to our correspondent's assistance *by their sending us sufficient and carefully packed specimens* so that no time be lost by unnecessary correspondence.

DISEASES AFFECTING GRAIN CROPS.

Of all fungus diseases affecting cultivated plants, those known as 'rust' and 'smut' of grain are economically by far the most important. Although, influenced by atmospheric and other physical conditions, these diseases may one year appear more disastrously than another, we are never in any year quite free from their attacks. The same statement practically applies all the world over wherever grain is grown. Regarding the enormous losses due to these parasitic fungi, one must feel surprised that modern scientific research has not yet resulted in the discovery of an absolute preventative. Happily, so much is known that, providing all suggestions are carefully observed, the losses may be considerably reduced.

RUST IN GRAIN.

Rust in cereals attacks all parts of the plants above ground. Cultivated grasses, varieties of grain and practically all wild grasses are subject to rust disease. This fungus grows best on green, healthy leaves producing the well-known rusty spots, and it soon exhausts the food in the cells of the leaves which turn yellow and become useless to the plant as food-producing organs. In a short time more leaves are attacked, the stem of the plant falls a victim to the disease and, in very bad years, such as 1904, the injury is capable of destroying a large part of the crop. This loss results mainly from the shrivelling of the grain which is very imperfectly developed. When drawing a rusted leaf between one's fingers, they will be covered with a fine orange yellow dust, composed entirely of the spores of the rust fungus. These spores are very minute and thus can easily be carried in the air for long distances. The orange coloured spores reproduce the disease wherever they come into contact with other plants of the same order. Later in the year, towards harvest time, one can observe instead of the orange coloured pustules small spots very similar in appearance, but black in colour. Indeed in winter one can invariably discover this form of the rust fungus on old straw. The blackish pustules, which are simply another form of the fungus, are composed of differently shaped spores, which are protected by a thick membrane and which may pass uninjured through the winter. In the following season these spores resume an active life again, but it is remarkable that this form of spore, although produced in the first instance on the leaves of cereals or other grasses, is not capable of germinating on the leaves of these plants. They change their host plant and germinate readily on leaves of various other plants, where they produce another series of rusty spots. In these spots, which are called 'cluster cups,' a third form of spore is produced which, when ripe and when coming again into contact with leaves of the grasses, produces the original pustules which we commonly term 'rust.'

Several types of rust may be distinguished. The commonest of all is known as 'Black Rust' or Stem Rust (*Puccinia graminis*, Pers.) This malady occurs on leaves of wheat, rye, oats, and, less frequently, barley. The fungus passes from plants of the grass family to the common Barberry (*Berberis vulgaris*, L.), and, after producing spores on this plant returns to the grasses and grain, infecting especially the haulms and leaves.

2. 'Brown Rust' or 'Leaf Rust' (*Puccinia rubigo vera,* De C.) produces dark-brownish winter spores and is found mainly on leaves and sheaths of wheat, rye and barley, but may also occur on oats, wild and cultivated grasses, like Brome and Rye grasses, &c. This rust passes on to species of the borage family (*Anchusa arvensis*, L., *A. officinalis,* L.)

3. Crown Rust (*Puccinia coronata*, Corda.) is most commonly found on oats, but has occasionally been found on wheat. It also occurs on grasses closely allied

to oats. It attacks exclusively the leaves, forming rather bright yellowish rust spots, and continues its life cycle on leaves of buckthorn (*Rhamnus catharticus*, L.).

We may regard these three species as the typical forms of Rust fungi occurring on cereals in Canada. Each species, however, is known to show some biological forms, which for our purpose need not be specially referred to.

SUGGESTIONS REGARDING PREVENTION OF RUST IN CEREALS.

Although our knowledge regarding the development of the parasites causing rust has been much advanced in recent years, when it was proved beyond doubt that these fungi leave during some period of their life the plants on which they originally grew, we have also learned that the propagation of the Rust fungi is not altogether dependent upon this change of host. In the case of Brown rust, for instance, it has been observed that this parasite may live through the winter by serial production of new generations of rust spores and also by means of a vegetative mycelium in the tissues of the leaves of winter grain. This unfortunate state of affairs renders preventive measures exceedingly difficult. The prevention of rust diseases would be comparatively easy, if the fungi had to depend for their livelihood entirely upon the secondary hosts. The destruction of these plants would mean an easy solution of the rust problem, but, as it is, this extermination is only one factor in the prevention of rusts. This means of prevention should not, however, be neglected. A thorough search should be made and such host plants be destroyed as may grow in the neighbourhood of the crops. The direct treatment of rusted plants with chemicals has not thus far proved useful, and such application of remedies over large areas would be attended with much expense. Seed treatment, which is of great value in restricting smut fungi, is of no use whatever as regards rust prevention. It is useful, in the first place, to plough the stubbles of rusted grain immediately after harvest. Grasses, such as the common Couch grass, which serves as a primary host for black rust, should be vigorously exterminated. Further, it is of importance to sow the winter grains as late as possible, while spring grains should be sown as early as possible. According to experience, this practice has resulted in minimizing the severity of rust epidemics. The mechanical or physical condition of the soil does not seem to influence an outbreak of rust; observations have shown that the disease may appear in the same degree on all kinds of soils. On the other hand, it has been repeatedly proved that the chemical condition of the soil plays an important role. The use of nitrogenous manures of any kind should be avoided; their use appears to favour the development of rust fungi, while, on the other hand, phosphates have shown a very favourable rust-preventing influence. While these observations are worthy of record, the most important factor to reduce the enormous losses due to rust diseases is undoubtedly the use of seed grain obtained from crops free from rust. Some varieties of grains are more subject to rust attacks than others, and in some years the virulence of rust varies greatly in different localities. Farmers should endeavour to ascertain when buying seed grain whether it was obtained from crops free from rust. There are indications that lead one to believe that rust resistance is a fixed character and that crops grown from rust-free parent stock are far less liable to be attacked. The question of this selection with the view of producing rust-resistant grain is one which engages many investigators and it is hoped that sooner or later a discovery will be made which at least will minimize the extraordinary losses due to this, our most injurious parasitic organism.

SMUT IN GRAIN.

The many inquiries relating to the smut diseases of grain and the existing difficulties in treating the seeds satisfactorily, and in the shortest time possible, have compelled us to start experiments with the view of combating this trouble by the most

practicable means. The results of our investigation will be published in due course. We shall be glad to answer any inquiries regarding the prevention of smut, although we do not treat of this subject in the present report. Western farmers are specially requested to communicate with us on the prevalence of Loose Smut in their wheat crops. This smut, unfortunately, is gaining more foothold in the west in recent years and great care should be exercised to prevent its increase.

DISEASES OF THE POTATO CROP.

There are three main factors responsible for the appearance and spread of any kind of disease affecting the potato crop, and if these are kept in mind by the grower he will generally succeed in keeping his crop free from disease. Potato diseases may occur:—

Firstly: When unsound seed tubers are planted.

Secondly: When sound tubers have been planted on land on which a diseased crop of potatoes was raised previously.

Thirdly: When spore infection of the growing plant takes place.

Thus it becomes very important to know which diseases, brought about in the first instance by spore infection, will also affect the tubers and also how to prevent the outbreak of such maladies. Farmers who are using their own grown tubers for seed can tell generally whether their crop was diseased or not. Hence, they also know whether to expect sound tubers or unsound tubers. But those who buy potatoes for seed elsewhere should be careful to ascertain whether they originate from sound stock. Potato diseases are chiefly spread by the use of infected seed-tubers, and serious infection may be introduced into land upon which crops formerly grown were free from disease. With very little trouble, this means of introducing potato diseases may be averted.

LATE BLIGHT, IRISH POTATO DISEASE (*PHYTOPHTHORA INFESTANS*, DE BARY).

This disease, which has also received the name of 'Potato Blight' and 'Potato Rot,' is the most serious offender in this respect propagated by unsound tubers. First, it pollutes the soil; secondly, affects the tubers, and lastly the growing plants. The chances of preventing this disease are far greater when sound tubers have been planted than where blighted ones were used.

Appearance and Cause.

Although this disease may be regarded as the most common and widely spread, it is still much confused with others, and few farmers are able to recognize, without doubt, whether the trouble is really due to the Potato Blight. The first signs may appear practically as soon as the plants begin to show above ground. Unfortunately these early signs often escape observation, until later in August the whole field represents unmistakable sings of the blight. At first the leaves show, generally around their edges, brownish irregular spots, which soon become black. These are practically the first suspicious signs. If, on examination of the lower surface of the leaves corresponding to the spots, one can observe (by means of a hand lens) a fine, whitish, mildewy growth, then one can generally conclude that the trouble is due to the common 'late blight.' Should damp weather prevail the spots will rapidly increase in size, the foliage becoming black within a day or two, and the crop may be totally ruined. The leaves, as is well-known, play a very important role in the assimilation of food, and if they are destroyed, few tubers can be formed on the plants. For this reason, the earlier potato blight appears in the field, the more severe will be the loss. On the other hand, should the disease make its appearance later in the season, the tubers that have been already formed are very liable to become infested and are thus rendered unfit for seed or for the table. The potato disease is due to the fungus *Phytophthora*

infestans. The whitish film referred to above, is composed of the filaments of this dangerous parasite. Numerous spores are produced which are very minute, and thus are easily carried by air currents all over the neighbourhood, when, on landing on potato leaves, they will germinate and reproduce the disease. Not only, however, are these spores responsible for the infection of the plants above ground, but they also fall to the ground in large numbers, and working their way through the soil, reach the tuber and cause direct infection in that region.

Prevention.

Infested tubers, when stored, will rot and decay, especially when there is little ventilation through the heap. Although tubers may be but slightly affected, the disease is liable to appear if they are used for seed. On the other hand we have observed that sometimes infested tubers produced healthy crops when planted. While this is the case as in many other potato diseases affecting the tuber, we would not advise the use of unsound tubers under any circumstances. The risk is too great and nothing is known of any practical treatment of the tubers to prevent the reproduction of the disease. The tubers to be used for seed should be selected immediately after harvest and should be stored by themselves in dry, cool cellars, which should be ventilated. Early varieties are far more liable to the disease than later ones. It has also been found that the newer varieties are less liable to the disease than the older ones. It is very fortunate that we have a really satisfactory remedy against potato blight. While it may be a good practice to spray the plants as soon as they appear above ground with Bordeaux mixture—and, by adding to it lead arsenate, to protect them from the ravages of the potato bug—yet it has been found sufficient to spray the crop immediately after the first symptoms of the disease are noticed. A 3 per cent solution of Bordeaux mixture, may be employed for this purpose. Spraying should be repeated at intervals practically till the harvest time of the tubers. When employing poisoned Bordeaux mixture, add to 40 imperial gallons of solution three pounds of lead arsenate and keep the solution constantly agitated when spraying. The late Dr. Fletcher referred to two varieties which have shown themselves very resistant in trials made by the Horticulturist, Mr. W. T. Macoun, at Ottawa, viz., 'Holborn Abundance' and 'State of Maine.' We should be glad to hear if these or any other varieties have proved themselves in general practice resistant to this very serious potato malady. In conclusion we should point out that, as the ground where a diseased crop was raised, is likely to be infested for some years, potatoes should not be grown thereon until about four years after. Neither should tomatoes be grown following immediately after a diseased crop of potatoes, as they are liable to be attacked by the same disease.

EARLY BLIGHT, (*MACROSPORIUM SOLANI*, E. & M.—*ALTERNARIA SOLANI*, SOR.)

The disease known as 'Early Blight' has received this name because it is said to attack more generally early varieties of potatoes. The disease to our knowledge is, however, not strictly confined to these varieties, as it is liable to attack any kind of potatoes, early or late. In some years, especially when the potato beetle or the flea beetle is very prevalent, the disease is likely to cause considerable injury to the potato crop.

Appearance and Cause.

Some observers record that the disease is not easily distinguished from Late Blight. This may be so when it is in an advanced stage or when both diseases are present, as is not infrequent, but the earliest symptoms of the disease are very distinct from Late Blight. The leaves are first attacked, showing a larger or smaller number of brownish spots, with a sharply defined roundish or wavy outline. These spots increase in size as the fungus grows and produce characteristic 'rings,' each

progressive growth resulting in the production of a new 'ring.' In time, several spots may become confluent, but the periodical rings are as a rule clearly perceptible. As long as there are only a few spots on the leaves, the damage to the crop is small, but as their number increases the leaves roll up and die, when, of course, the injury becomes serious. The spots have been noticed on the leaf stalks and also on the young sprouts of potatoes. The fungus covers the diseased parts with a dark, olive-green layer and is easily recognized under a microscope by its peculiar club-shaped, many-divisioned, olive-brown spores. When germinating, several divisions in the spores may send out germinal tubes and these, permeating the leaf tissues, serve to rapidly reproduce the disease.

Prevention.

Wherever careful spraying methods are practised, the disease is very unlikely to appear or to cause injury. We recommend the same treatment as suggested for 'Late Blight.'

POTATO SCAB.

'Scab' is without doubt the commonest of potato diseases and is exclusively confined to the surface of the tuber. The well-known scabby patches render the sale of such potatoes for table purposes difficult. When peeled, however, all signs are removed and the potato is as fit for the table as any other kind. This malady never affects the interior of the tuber and may be looked upon as not of serious economic importance, as it very rarely reduces the quantity of the harvest. Scab is very probably due to some parasitic organism which gains entrance through minute scratches in the surface of the tuber, which may be self-inflicted as the tuber grows in the soil. Whether the organism isolated by Prof. R. Thaxter and named by him *Oospora scabies* is the real and only cause of the very common scab disease or whether the scab is due to physical or mechanical conditions, remains still doubtful. Scab of potatoes is well-known in Europe and externally not distinguishable from the malady occurring in Canada and the United States, yet the fungus *Oospora* has to my knowledge, never been observed as the cause of scab in Europe. It has often been observed that the harvest obtained when scabby seed potatoes were planted was quite free from scab, although the tubers were not treated in any way previous to planting. We also know, however, that sound tubers planted on land on which a crop of scabby tubers was raised, showed scab injury in a marked degree. Yet scab has also appeared when sound tubers were planted on land that has never borne a diseased or indeed any crop of potatoes at all. This seems to indicate that the infective source is present in the soil. Alkaline soils are said to favour the appearance of scab, but no reliable conclusion has as yet been arrived at, as the disease is by no means confined to any particular kind of soil. While we point out that the value of scabby potatoes is by no means impaired for table purposes, we would refrain from using such for seed and would endeavour to procure really sound tubers to plant. In order to take every precautionary measure known at present we would not recommend planting sound tubers on land that is known to have borne a diseased crop previously; and in years when it is not possible to secure tubers free from scab we would immerse the tubers intended for seed, before cutting them up, for 1½—2 hours in a solution made up of one part of corrosive sublimate to 10,000 parts of water. No variety of potato has yet been discovered which is not attacked sooner or later by scab. Some varieties certainly show a more pronounced tendency towards it than others. This, unfortunately, varies in every locality where the same kind may be grown.

WET AND DRY ROT OF STORED POTATOES.

Towards the end of the potato season inquiries dealing with various forms of wet or dry rot of stored potatoes are very numerous. It may be said that potatoes harvested in a perfectly sound condition, that is to say, free from mechanical injuries

fected young fruits fall early to the ground, and those remaining on the trees are exposed to the attacks of a large number of wound parasites, causing them to decay, while still on the tree. Especially in wet years, naturally deficient in sunshine, the quantity of fruit is much reduced and the quality considerably impaired. Scabby fruits always weigh less, being much smaller in size than healthy, smooth fruits. The following experience may here be related which would serve to illustrate the actual loss due to the ravages of the scab fungus. Twenty-five carefully selected and perfectly sound apples were taken from the yield of one single tree; they accurately represented the average quality. The same precaution was taken in choosing twenty-five average fruits showing scab injury. The samples were weighed, with the following result:—

	Weight in ounces.
Twenty-five apples free from scab	38
Twenty-five apples scabbed	15½

It is evident that the freedom from scab involves far larger returns. The fungus growing on the *leaves* is less conspicuous, producing a somewhat sooty appearance in them. In apple leaves, mainly the upper surface will be found affected, while, in the pear, the lower surface shows the sooty areas. The leaves are rarely killed, though they become in time somewhat dull in colour. However, in considering the fact that a dense fungus covering greatly interferes with the natural functions of the leaves one may realize that such trees must necessarily be retarded in growth. In severe attacks, the leaves fall prematurely and the food supply is largely cut off; the result will be unripe wood, and winter injury may occur very early in especially severe attacks, when the tree is liable to produce a new growth and thus use up too much of its reserve food. Naturally such trees will be much weakened and cannot be expected to produce fruit. Thus the feeble growth of trees in orchards which, for years, have been seriously affected with the scab disease is explained, and a useful lesson is to be learned in seriously attacking this pest.

The *young shoots* may also become affected. The fungus begins its work here in the same manner as on the fruit. First one may notice the characteristic blackening of some tips, followed later by a splitting and peeling off of the bark. The progress of the fungus on the small branches is slow, but eventually the tips are killed and thus future growth is impossible. Severe outbreaks result in producing dead tips all over the trees, and they are only fit to be taken up and destroyed, while timely attention and careful pruning would have prolonged the life of the trees, if not saved them altogether.

Prevention.

The fungus causing scab passes the winter in the following manner: First, on the leaves and fruits that have fallen to the ground, when another form of spores (*Venturia*) is produced; these spores are shed early in the spring and germinate on the young leaves, producing the black soot-like spots already described. The soft tissues of the new leaves offer little resistance to the growth of the fungus, and the spores (*Fusicladium*) are rapidly produced, and these in their turn affect the young fruits as soon as flowering is over. Second, small black patches of the fungus growth may readily be discovered in winter on the tips of branches attacked during the summer, as well as in the fissures and crevices of the bark. From these observations the following conclusions regarding prevention may be drawn:—

1. All leaves and fruits lying on the ground should be dug in deeply immediately after harvest, or be collected and destroyed by fire.

2. The careful removal of any dead wood, subsequently to be destroyed by fire, becomes an important necessity in preventing the hibernation of the fungus.

3. The trees should be sprayed thrice with Bordeaux mixture—

(*a*) As soon as the leaves begin to unfold.
(*b*) As soon as the petals of the flowers have fallen off.
(*c*) A fortnight or three weeks after the second application.

The first application is intended to destroy any fungus that has not been removed in autumn. The second and third spraying is to prevent the fungus spores from starting into active life, by germinating on leaves and fruits.

BRANCH CANKER OF FRUIT TREES (*NECTRIA DITISSIMA*, TUL.)

(See Fig. 1.)

Canker spots, that is, rough, scurfy-looking, often swollen and contorted portions on branches of trees, are due to several causes. At least fruit growers apply the term 'Canker' in a broad manner to any rough-looking wounds, or they may confuse aphid attacks or frost injuries with the true parasitic cankers caused by the fungus above named. Repeated frost injury may certainly produce complications similar in appearance to canker; insects' punctures, especially those due to the woolly aphis,

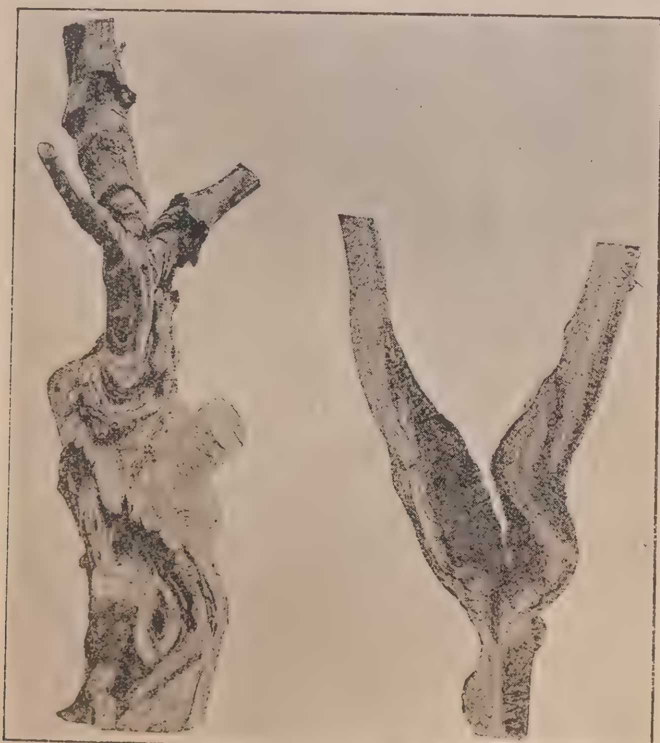


FIG. 1—Branch Canker *(Nectria ditissima)* (after v. Tubeuf).

may irritate the soft cambial tissues and result in the production of small, roundish, gall-like knobs round the edges of wounds, &c., and, finally, cankerous spots may result from an attack of trunk or branch borers. The *Nectria* canker, however, is the

caused by the implements used in digging, free from disease and physical injury, and when stored under suitable conditions, practically never rot or decay. Potatoes that are much affected in this way have either had the potato disease (*Phytophthora*) Basal Rot, (*Bacillus solanacearum*) or some other kind of disease affecting the tuber, or the growers have been careless in digging the tubers, thus injuring many of them. All such potatoes are apt to decay in storage and the trouble is liable to spread to sound tubers also. Dark and warm cellars favour the development of all kinds of rots and storage diseases. The cellar should be cold, but free from frost, and should be frequently ventilated. The tubers ought not to be piled up too high but should be stored in rather flat layers. At intervals they should be turned over and any diseased tuber be removed when met with. It is a good plan to separate the required quantity of seed tubers soon after harvest, selecting sound and properly sized ones and to store them separately under the most favourable conditions available, when they will be found at sowing time in excellent condition and well worth the little extra trouble necessary to pick them out.

POTATO CANKER (*SYNCHYTRIUM ENDOBIOTICUM*, PERCIVAL)= *CHRYSOPHLYCTIS ENDOBIOTICA*, SCHILB.)

A full account and description of the discovery in Newfoundland of this potato malady, viewed with greatest anxiety in Europe, was given in Bulletin 63, of the Central Experimental Farm, published during the year. In October, specimens of this disease were received by the Division from Red Island, Placentia Bay, Nowfoundland. On recognizing the presence of this serious disease in so close proximity to the Dominion of Canada and in view of the fact that this disease was unknown till that date on this side of the Atlantic the writer sought and received the permission to investigate the nature of the outbreak of this malady in its latest locality; as it was important to observe the behaviour of the newly-introduced parasite under these new conditions and to ascertain whether the disease was at all likely to gain a foothold under the new conditions. It was also realized that to prevent the introduction of potato canker into the Dominion of Canada, the most severe precautionary measures had to be taken. Not only is the disease very destructive to the potato crop, as will be seen from our observation of the malady in Newfoundland, but also cases have occurred where considerable injury was caused to men and animals who partook of potatoes affected by the disease. From our personal experience with this disease in European countries, we may say that we consider it far more destructive than the common potato disease (*Phytophthora infestans*, De Bary), especially as there are no remedies known for the canker, hence potato growers should exercise great care to prevent their using infected seed tubers. We caution especially those who may import seed potatoes in any quantity from abroad. In Europe the disease has been rampant for about twenty-five years and, although no case has yet been reported from the United States, it is possible for seed tubers from Europe to enter Canada via the States. At any rate the greatest caution is advisable where imported tubers are being used. It is hoped that those who have received the bulletin published both in French and in English will be aware of the earliest symptoms of the malady by which it may be recognized. Fortunately, the disease is very conspicuous even in the earliest stages, and, if it is made a practice to examine every seed tuber before planting, it is readily discovered on these tubers by the peculiar swellings varying from the size of a pin's head to a pea and situated round the 'eye' of the potato. Hence all the eyes should be subjected to careful scrutiny. No potato showing any kind of smooth or clustered abnormal growth should be planted. It must be pointed out that in the recognition of the disease in the seed tuber and in the strict destruction of suspicious ones, lies the whole salvation from the introduction and dissemination of this dangerous parasite. My visit to New-

foundland was made at a very unfavourable time of the year, viz. in November and the satisfactory result was largely due to the kindness of all Newfoundlanders with whom I came into contact and amply compensated me for an unpleasant and stormy voyage. My thanks are especially due to the kindness of the Honourable the Minister of Agriculture and Mines of Newfoundland and his courteous deputy, Mr. Turner, at St. John's, Newfoundland. At Placentia Bay the magistrate, Mr. O'Reilly, very kindly assisted in every way, and his energetic services, often rendered at late hours of the night, enabled me to make a good survey of the infested locality. The disease was known practically to most of the growers, all fishermen, who grew the potatoes for their own use on a small scale. Their experience has been to plant three barrels of tubers and their harvest was often less than one barrel of sound tubers. It was discovered that the disease was imported with seed tubers obtained from Scotland as long as ten years ago. In the meantime, it made unchecked progress and has appeared in many localities of Newfoundland. We used the occasion of our visit to Newfoundland to instruct the growers wherever we met with them, and the press also devoted much attention to the outbreak of the disease in this colony so it is hoped that the disease may be wiped out in the island and have no opportunity of being introduced into Canada. The Newfoundland Department of Agriculture requested us to prepare for their use a pamphlet describing and illustrating the disease. This publication was prepared by the permission of the Honourable Mr. Fisher, Minister of Agriculture, and was much appreciated by the Department in Newfoundland. We have endeavoured to leave nothing undone to prevent the introduction of the disease into this country, but we must point out that it mainly rests with the potato growers of the Dominion whether the disease is introduced. We have every hope to see the importation of potatoes from infected areas much restricted or altogether prohibited, if necessary, under the new Act directed against the introduction and dissemination of insect pests and plant diseases destructive to vegetation; which at the time of writing is under consideration before the House. Up to the date of writing this report, there was no single case of potato canker discovered in Canada and we should be pleased to be able to report this every year.

APPLE SCAB (*FUSICLADIUM DENDRITICUM* [WALLR.] FUCK.=*VENTURIA INÆQUALIS* [CKe.] *ADER.*)—PEAR SCAB (*FUSICLADIUM PIRINUM*, LIB.=*VENTURIA DITRICHA* [FRIES.] *VAR. PYRI ?*)

The injury which is caused by these two fungi in apple and pear orchards is well known, but the damage due to their attacks is very often underestimated. In consequence of repeated inquiries received from our correspondents we give herewith a careful account of the appearance, cause and prevention of this very common fruit pest.

Appearance and Cause.

The injury occurs on the fruits, leaves and young shoots of apple and pear trees. Not necessarily, though, will all three parts be found affected on one and the same tree. The appearance of scabby *fruit* is doubtless universally known. We also know that scabby fruit is inferior in appearance, taste, and keeping qualities. The infection of the fruits may take place at a very early stage of their development; it is by no means a rare occurrence to see apples or pears affected, when but of the size of a large pea. To these very early affections—the fungus killing the tissues and thus preventing a uniform swelling or expansion of the growing fruits—the more or less pronounced malformations of the fruits and the well-known cracks and fissures almost constantly associated with fruit scab injuries are due. As a rule, many of the in-

commonest form on our fruit trees, occurring on apple trees far more generally than on pear trees. It is to be met with on all fruit trees, wild or cultivated, and on some shade trees.

Appearance and Cause.

When examining old apple trees, especially in neglected orchards, one is almost sure to encounter some cankerous spots. They may be recognized as rough, deeply-fissured injuries, generally situated at the point of junction where two branches grow closely together, (crotches), or on larger branches around small, dead twigs, which may have been left by careless pruning. In stone fruit trees like plum, peach and cherry, their appearance is less characteristic; in these trees, the bark peels off and curls back and a flow of gum generally acompanies the injury. The best signs by which the true parasitic canker may be distinguished from any similar lesions are the peculiar, more or less regular, concentric rings round the centre of the wound. Less frequent is the so-called covered canker, which is a smoother form with apparently no open wound. These enlarged, gall-like growths, however, will exhibit, when cut open, decaying wood tissues in the centre. In summer, when wet weather prevails, these rough patches frequently exhibit a number of fluffy dots appearing like small tufts of cotton wool. In winter, by using a pocket lens, a careful observer may detect on the rough portion of the wound, often covered by the scaly bark, a number of scattered, deep crimson, globular bodies, less in size than a pin's head. Both stages belong to the same fungus, viz., *Nectria ditissima,* Tul. The former stage produces summer, the latter winter spores, both of which are capable of reproducing the disease, when germinating on favourable spots, such as wounds left from pruning, cracks due to frost, punctures from insects, &c. When any canker fungus spore germinates, it permeates the tissues of the plants with a fine, microscopic spawn and causes the death of the cells in which it grows. As a natural consequence, the dead area becomes sunken and the active, growing layer around the dead tissues endeavours to cover this injury by forming an outgrowth of protective cells around the edges of the wound. These cells are subsequently attacked by the fungus and the renewed attacks and successive endeavours of the plant to heal the wounds caused, finally result in producing the conspicuous canker spots. As soon as the cankerous growth encircles the branch, the flow of sap is cut off and the branch will die.

Prevention.

It has been noticed that not every variety of fruit is liable in the same degree to canker injury. The fruit grower, therefore, should ascertain this in his own case and keep a note of all cankered trees and select such for planting as have shown themselves free from canker spots. The degree of susceptibility of the various varieties of fruits, unfortunately, varies in different localities. This is to say, in the eastern provinces there may be found trees regularly attacked by canker, while in western localities the same varieties may be among those quite free from attacks. Thus it is, at present, impossible to suggest varieties which are universally free from canker and the experience of the observant grower must decide which kinds to grow in his own locality. Information regarding these observations from all fruit-growing centres will be of great value to the Division of Botany and enable it to assist many fruit-growers in different districts.

On the other hand, it has been commonly observed that fruit trees grown on heavy, stiff, clayey soil are generally attacked. Hence it becomes necessary to adopt careful methods of drainage to prevent a general injury from the canker fungus. As a means of preventing canker from spreading, not only the trees in one's plantation should be watched, but also any shade trees or wild fruit trees in the neighbourhood of the orchard, which are also liable to be attacked. The cankerous

branches should be cut out where practicable and be burned. In some cases, however, a chisel may be employed to cut away the diseased tissues, the cutting to extend about one inch all round the cankerous spots and to reach down into the healthy wood. These wounds should then be painted immediately with coal tar or white lead to prevent reinfection. In due course, the production of cells from the active layer underneath the bark of the trees takes place and, providing the wounds have been properly attended to, they will heal over in a few years' time. It is advisable not to operate on the trees during their active process of growth, but to carry such operations out preferably during the autumn.

CORAL SPOT FUNGUS (*NECTRIA CINNABARINA*, TODE).

(See Fig. 2.)

Although injuries caused by this fungus are not confined to fruit trees, but occur on practically all deciduous trees and shrubs, reference to it is made here because of its close relationship to the fungus causing canker of fruit trees. It was not proved until comparatively recently that the fungus is capable of attacking growing, that is living, plant tissues.

Appearance and Cause.

This fungus is far more common and conspicuous than the last species. It occurs on wood of berry bushes, fruit and shade trees, forming prominent

FIG. 2—Coral Spot Fungus (*Nectria cinnabarina*, Tode). In nature the spots which are seen here breaking through the bark are bright red in colour (after v. Tubeuf).

reddish pustules that are spread over the bark of affected plants. These small, coral-coloured spots are soft, cushion-like, summer fruiting layers, of the fungus named above. The fungus spores that are developed in this fruiting layer grow

readily upon tissues which are weakened by some physical or mechanical cause. These pustules are common sights on twigs and branches piled in heaps together, and frequently cover all parts of these limbs with the coral-like spots. Any unprotected (untarred) wound offers opportunities for the germination of the fungus spores. When such has taken place, the fine root-like spawn of the fungus quickly permeates the cells of the growing layer of the trees causing in time the death of the tissues and breaking later on through the pores or accidental cracks in the bark, when the reddish cushions become visible. Thus the fungus is often found appearing all around wounds in the bark of trees. It soon will 'ring' the attacked branch, which in consequence shrivels and dries up all above the seat of the injury. We must here explain that the 'growing layer' or the 'active layer' of trees, (the 'Cambial layer' or 'Cambium' of the botanist) is situated immediately beneath the bark. The most important function of this layer is to produce towards its exterior, bark tissues, while its cells towards the wood form new wood tissues. We may now readily understand, that no growth can take place when the 'growing layer' is destroyed all around the limb of a tree. The sap conducting vessels contained therein are also destroyed and the tops—not being supplied with the necessary materials for their growth—dry up and die. The progress of the fungus is rapid, thus the cambium is afforded no chance to produce new cells. As a result, the wounds do not heal over, as has been described under the note on canker of fruit trees. The spores produced on these red cushions become easily detached and are washed by the rain down the limbs and trunk of the trees, germinating as soon as they land upon the surface of a wound. In spring one can observe occasionally another form of fruiting body very similar in appearance to the winter form of the fruit canker fungus. The Coral Spot fungus rarely produces cankerous tumours like the other canker fungus. The bark remains intact, but is somewhat sunken in, where attacked.

Prevention.

All branches showing the coral-like masses of the fungus should be removed and destroyed by fire as soon as they are discovered. They should not be piled together with any other branches pruned off the trees. Simply removing the attacked branches does not kill the fungus and, if not burned in a short time, the whole pile of twigs and branches will be covered with the red pustules of the fungus and ripe spores will be produced again quickly and sooner or later they are sure to come into contact with some wound. Such a wound may be so minute, that it is hardly perceptible to the naked eye. The mode of life of this fungus indicates the great necessity of attending to wounds as soon as they are noticed. It also emphasizes the necessity of preventing insect pests from establishing themselves in the orchard. It has long been recognized that the small punctures produced by sucking insects and the larger ones due to bark borers, provide places for the germination of the spores of wound parasites such as the Coral Spot disease and numerous others.

SILVER LEAF.

(See Plate 1, Fig. 1.)

The presence of this disease was recognized in apple trees from Nova Scotia. Little is known as yet about the distribution of this malady in other parts of the Dominion, but there is reason to believe that it is more widely present than may appear. It is advisable that growers of any kind of fruit trees should study carefully the following account of the disease and examine their orchards with the view of ascertaining the presence or absence of it amongst their own trees. Specimens of the branches of any tree, that appears suspicious should be immediately forwarded to the Division of Botany for identification. The disease is well-known throughout England and there is no reason to doubt that the malady known as 'Milchglanz' in Germany is identical with it.

Appearance.

When the disease is present, the leaves of the affected trees, which may be peach, cherry, plum, almond, apple or pear, possess a peculiar silvery appearance or milky white gloss, which is especially noticeable on the upper surafce of the leaves. When bending the affected leaf, keeping the upper surface towards the operator, the epidermis or 'skin' will be observed to be very brittle, cracking in many places, which is not so possible when trying this experiment with a sound, dark green leaf. At the beginning of the disease, a single branch of a tree may show the silvery leaves; they remain of this colour throughout the season and may readily be noticed. In other trees, the whole foliage may appear silvery from the earliest stage. When a branch is attacked, it dies as a rule after one or two years, and another one becomes infected and so on till the whole tree succumbs in time. It is then thrown out and the stump is left frequently in the ground. In autumn, this stump will invariably be found covered with the outgrowth of one of the larger fungi, forming more or less large scaly brackets, marked with a whitish and purplish seam. The fungus will also appear on the dead branches, when the scales are somewhat adpressed and much smaller. In these outgrowing bodies, is produced the fructification of the fungus *Stereum purpureum,* Pers. Numerous small, oval spores are shed when ripe and are liable to infect any unattended wound left from pruning or caused by breakages from wind, snow, etc. The fungus grows in the woody tissues of the affected trees and soon, generally six weeks after an infection has taken place, the leaves will exhibit the silvery gloss. The fungus is closely related to other bracket fungi or punks and like these works its way slowly in the trees, till it has succeeded in breaking through the bark, when the fruiting bodies are produced.

It may be mentioned here that, in the opinion of some European workers, the silvery appearance of the leaves is due to some physiological cause. The disease is by no means fully understood. It is remarkable though, that the fungus *Stereum* is constantly associated with the disease. The writer has observed it in England and has again observed it on silver leaf trees growing in Canada. The fungus is such that it cannot be said whether it is the cause of the malady. At present we regard it as suspicious and we would be glad to have specimens from any locality where the disease may occur to ascertain the real connection of the fungus to this disease.

Prevention.

This will depend greatly upon the extent to which the disease is noticed. If a single branch is affected, cut it right off, to the healthy wood; and keep on cutting away branches till the tree must be taken up as useless. All wounds should be attended to and painted with white lead. Never allow dead branches to remain on the trees otherwise the fungus, should it really prove the cause, will get a chance to produce its fruiting bodies and the disease is liable to spread wholesale. The stumps should be dug up and all infected material be destroyed by fire, as the fungus is capable of producing its fruiting stages on branches, stem and roots, that are left lying on the ground. There is no use in spraying. No spray is likely to reach the seat of the disease, which is in the interior of the trunk and branches.

Our experience with Silver Leaf is that it becomes of considerable importance if no timely measures are taken. Fruit growers attention is particularly called to this occurrence.

FIRE BLIGHT (*BACILLUS AMYLOVORUS* [BURRILL] DE TONI).

(See Plate 2—Fig. 2.)

This disease is also termed Pear Blight and Apple Blight according to which kind of fruit tree is attacked, but it has been proved that, though injuring all kinds

of wild and cultivated apple and pear trees it is caused by one and the same organism. The disease, which is as yet unknown in Europe, is widely spread over the continent of America and is responsible for a considerable amount of damage to orchard trees.

Appearance and Cause.

The disease usually appears very suddenly. The young leaves of orchard trees may just have grown to full size when there will be noticed, without any previous warning symptom, a sudden turning of the uppermost leaves of various twigs to a red-brown colour as if they were scorched by fire. Within a few days the leaves become black and are found hanging in a limp fashion from the twigs, but they do not drop off until late in autumn. Daily, if unchecked, the disease may be seen to spread down the limb and more leaves turn colour. The tips by then have begun to shrivel up, which process follows within a day or two after the discolouration of the leaves. In severe cases, the blossoms and the young fruits that may have developed also turn black. The disease in its progress soon kills off all, even the larger, limbs of the trees, the bark of which often shows large, longitudinal cracks.

The cause of the pear and apple blight is a very minute bacterial organism. It is constantly observed by the investigator in the wood, bark, flowers and fruits of fire-blighted trees, but it is impossible for a casual observer without the help of a powerful microscope and careful study to recognize the organisms. Fruit growers, no doubt, are well acquainted with this disease and can easily distinguish it from other diseases by the symptoms described. The disease has been observed by the writer not only on cultivated and wild apple and pear trees, but on blackthorn, hawthorn, mountain ash and other closely related trees or shrubs. It is probable that stone fruits may also be attacked, but not sufficient evidence has been obtained on this point. It would be of great value if growers were to send any suspicious looking twigs from the latter trees to the Division for examination.

Prevention.

The infection of healthy trees from diseased ones takes place very readily. As this is the case, the longer any diseased twig is allowed to remain on trees the more liable is the disease to spread. It has been shown that the disease germ is carried by bees and other insects from flower to flower and from tree to tree. Speedy removal of diseased branches, therefore, is one of the most important steps in the prevention of the spread of the disease. It is to be regretted that many fruit growers as well as farmers are so indifferent in recognizing this very simple rule in preventing diseases from spreading. The success of the 'Board of Health' of large cities in preventing the spread of any infectious disease like typhoid, tuberculosis, diphtheria and many others can only be achieved if the suggestions concerning the destruction of any contaminated materials or utensils are strictly carried out. Why, then, farmers and fruit growers are so negligent in this direction has never been understood by the writer, for certainly it is unwise to learn a lesson only after experiencing serious losses. There is no use whatever of harbouring in the orchard or on the farm all kinds of refuse and rubbish. Burn it and get rid of it—that is the best advice that can be given, besides being the most important means of checking all kinds of disease. Where Fire Blight is rampant and allowed to make unchecked progress there will be, in time, no harvest. It would pay a grower to employ the services of one man to do nothing else but keep a watch on the trees and cut away at once all signs of the disease and burn them immediately. Not only should wounds resulting from pruning trees, or due to physical or mechanical injury, be painted over with some kind of impermeable paint (such as coal tar, white lead, &c.), but in the case of Fire Blight another precaution is necessary when pruning the orchard in autumn. Where, for instance, a limb is cut off an infested tree, the instrument used becomes infected, and should under no circumstances be used on any healthy tree unless it is wiped

carefully several times with a rag dipped into a solution of Corrosive Sublimate (1 oz. Corros. Sublimate to 1,000 oz. of water). This strong germicide will kill any organism adhering to knife, shears or saw. To simplify matters, it is recommended that the man employed for this purpose be provided with a light wooden box, carried by means of straps like a tray, in which is contained a wide-mouthed glass jar filled with the Sublimate solution and a small tin containing white lead, tar or any other substance that may be applied with a brush to the surface of wounds. Again let it be repeated, burn all wood, that has been cut off, immediately. Always cut right down to healthy wood and leave a smooth wound surface, which is to be painted over.

CROWN OR ROOT GALL OF FRUIT TREES AND SHRUBS.

(See Fig. 3.)

This term is applied to the peculiar knot-like swellings occurring on the 'neck' or 'crown' of all kinds of fruit trees and shrubs. Frequently the same term is used

Fig. 3—Crown-gall (original).

in describing similar hard woody knobs occurring on the roots of the same trees. The disease—if, with our present knowledge, we have any right to speak of it as such—is

one universally known to fruit-growers all over the world. By some investigators it is regarded 'as the greatest scourge of fruit culture'; others, however, hold that crown gall is not injurious at all. These two different opinions and frequent inquiries relating to the cause and prevention of this phenomenon caused a very exhaustive inquiry to be made into the subject, with the view of ascertaining the prevalence of it in other countries besides Canada and the United States. While those inquiries showed that crown or root gall is known in practically all fruit-growing countries of the world, and also indicated definitely that, if really due to crown gall, the injuries to fruit trees are of little consequence, no information whatever was obtained as regards the cause of it. In reviewing the existing literature on the subject, one again comes across very contradictory opinions. The majority of publications on the subject agree that the crown gall is a disease, that is, it is due to a parasitic organism; it is contracted and capable of spreading by means of infection. These opinions are held by many scientific men, especially in the United States. The smaller number of observers, without exception experienced growers, not only repudiate the disease theory, but provide ample material worthy of consideration and indicative of little or rather no damage to trees or shrubs on which these swellings are noticed. This state of affairs, in our opinion, is very unfortunate; it plainly illustrates the tendencies of many present-day scientific workers to ignore the most valuable data collected by the experienced practical man. This insatiable quest of the microbe has so frequently made good and reliable men shut their eyes to a clear and common-sense conception of affairs.

We are desirous of learning more of this crown gall, and would gladly welcome any opinion of our experienced growers as to the damage done to the trees. We ask them cordially for specimens of these galls that they may observe on any kind of fruit tree or berry bush. Information should always be given as to the nature of cultivation, the condition of the soil, and careful records be kept on the appearance of trees that are known to show crown gall, with the view of discovering any external symptom on the growing tree. Only when many hundreds of growers supply these details will it become possible to draw valuable conclusions. Our experience of crown gall at present rather tends to prove that no damage is done to the trees. We have examined large series of seeedlings and trees of all ages and have only discovered hard, woody galls; every case of which we have been able to trace to a former injury to the cambium, such as may be caused, for instance, by a hoe, when cleaning the rows of young trees from weeds. Far less common is the root gall in seedling trees, and, when such were found, we discovered generally a twist or a bend or breakage of tissues. It is a remarkable fact that crown gall and root gall are so common on trees—such as fruit trees—that have been transplanted two or more times; in some cases we have found them to have been transplanted four times. Every transplanting of a tree must cause some injury to the roots however carefully it may be transplanted. The galls which we have examined all showed more or less large developments of so-called callous tissues such as are commonly produced in raising cuttings from woody shrubs or trees. One case may be cited as particularly illustrative. In this case, like that of 90 per cent of the trees showing crown galls on the place of union between stock and scion, the gall was observed all around the tissues of the stock; the scion, reaching, with the characteristic tongues practised in grafting, right into the stock, and plainly traceable on both sides, was free from any kind of swelling. It is certainly impossible in this case that any parasitic organism has been involved, or why was not the scion attacked as well? The question of a disease-resisting variety of this scion is too absurd to be taken into consideration. We regard this proliferation of tissues in such cases due to a conglomeration of adventitious buds. There are many examples which may be cited of gall-like protuberances, often as large as a cow's head (*vide,* Bird's-eye formation, 'Maserholz'), in all kinds of trees. Here the buds have formed during the time the stock was growing, but their progress was ar-

FIG. 1.—SILVER LEAF DISEASE IN APPLES (*Stereum purpureum*).—The top branch shows the silvery appearance of leaves when compared with the healthy twig below. The twigs towards the right show the fructification of the causal fungus.

FIG. 2.—WHITE PINE BLISTER RUST (*Peridermium Strobi*).—1 Young Pine Seedling showing immediately below branches the pale cushions which in fresh specimens are orange in colour. 2. Winter condition. 3. Currant leaf attacked (after v. Tubeuf).

16—p. 272

FIG. 1.—HORSETAIL (*Equisetum arvense*).—A plant poisonous to stock. To the left flowering branch found in spring. To the right, plant as it appears during summer.

FIG. 2.—FIRE BLIGHT IN APPLE (*Bacillus amylovorus*).—The two small twigs are killed by the disease; the leaves appear brown in colour. Note the fruit attacked

rested as soon as the scion had 'taken,' the sap formerly largely used in supplying the buds was then conducted into the vessels of the scion and, the pressure being removed, the adventitious buds remained dormant. There are, on the other hand, certain physiological differences in the growth of stock and scion; in some varieties more so than in others. There is the natural difference in the growth of the two kinds of vegetation forced by man's hand to become one. The stock with its roots will always have the advantage over the scion until a perfect union is established. We naturally must expect some deviation from the normal, and the most plausible explanation is the natural functions of stock and scion resulting in the production of a proliferation of growth in the more vigorous of the two. This is our experience in relation to this kind of crown gall. Another kind we have found to arise where a mechanical injury occurred at some time or other to the cambium. Here, like in the root galls, where we also observed primary mechanical injuries, we consider that the formation of wound tissues might alone be responsible for the production of the peculiar knob-like swellings—certainly these tissues may experience all kinds of further physical or mechanical injury and hence still more enlarge—or *parasitic organisms may here step in and do the rest.* But this theory of bacterial injury cannot stand much investigation in considering the behaviour of the tubercular galls of other vegetation; where, when the organism has gained entrance through a wound, galls may be produced at this point, but are known to also appear on other portions of the inoculated plant where no incision was made. This is, of course, owing to the very minute organism being conducted by the sap of the plant to other parts and deposited at some special point where it rests from its wanderings and multiplies and produces other galls. Thus the mode of life of the bacterial organism which is said to be responsible for the production of crown and root galls where mechanical injuries have primarily occurred, certainly differs from any other tubercle-producing organism known. We have never observed any gall formed spontaneously anywhere but on the roots or crown of trees. The evidence of some investigators, we regret, has not been convincing, and while we are quite aware that our own conception is by no means conclusive, we shall be pleased to have any interested investigator examine the many specimens on which our conclusion is based.

In the United States, investigators distinguish 'hard' and 'soft' crown galls; seemingly, only the latter are due to parasitic organisms. We have not seen any 'soft' galls in this country. All specimens that have reached us were hard, woody galls. In connection with these galls, reference is frequently made in the States to 'hairy root.' How closely this hairy root is related to crown gall has not yet been proved. We have no evidence whatever that the hairy root is injurious at all, and are waiting the results of our experiments before expressing any opinion on it. We have, however, come across some interesting observations made by some of our foremost fruit growers, which we wish to cite here, trusting that more cases will be brought to our notice for investigation. One prominent grower had a small area planted with raspberries. These on being taken up showed many 'root galls.' The plants were destroyed and no specimens were sent us for examination. The grower then planted a large area to young peach trees, the rows of which passed through the land formerly occupied by the raspberries on which the root galls were discovered. He then observed that the peaches growing on this latter area were not doing well and finally failed, while all the other trees did exceedingly well. On taking up the failing peach trees, their roots showed plenty of root galls, while the others growing outside the raspberry area were free from it. The same facts were recorded by other growers. There could hardly be given a more typical example of an infectious disease. But, unfortunately, we were not acquainted with any of these observations until it was too late to make any investigation. If these facts as related are correct, and we have no reason to doubt them, there is still a considerable amount of research necessary. We sincerely trust that the fruit-growers of this country will assist the Division of

Botany in reporting immediately any such observations, and thus enable it to make careful investigations; as it is, no means of prevention other than care in planting and hoeing and wrapping the grafts can be offered. It is hoped, however, that the nature of the phenomenon known as root or crown gall may soon be ascertained, and that the confusion at present existing may be cleared up.

BACTERIAL WILT OF CUCUMBERS AND MELONS (*BACILLUS TRACHEIPHILUS*, ERW. SMITH.)

Where this disease has appeared, it worked rapid destruction of the cucumber or melon crop. It differs from many other bacterial diseases in producing no soft rots or decay of any kind.

Appearance and Cause.

The appearance of plants which experience a sudden period of drought is well known to growers by the flagging of the leaves, which symptoms will disappear a few hours after watering of the plants. The bacterial wilt disease of these cucurbitaceous plants somewhat resembles acute drought. But watering has no effect in restoring the plants to their normal conditions, the flagging being rapidly followed by the wilting of the plants. Generally, the disease starts in one or several patches in the field and if affected plants are noticed they should be pulled up, roots and all, and be burned.

On closely examining diseased plants, one is generally able to detect small blanched, elongated patches on the central stems. These parched wounds, undoubtedly due in the first instance to some biting or sucking insect, provide places for the entrance of the bacterial organism which may later be recognized in the vessels of the affected plants. As soon as they become clogged by the bacteria the flow of the sap is arrested and the wilting of the whole vine is the natural consequence. Thus, when receiving specimens of this disease, the recognition of the injury is often found difficult and depends very much upon suitable portions being sent, i.e., the main stem with about a yard of each lateral vine; for no bacteria may be discovered in the wilted portions some distance away from the seat of infection.

Prevention.

Besides preventing insects from attacking melons or cucumbers by the use of insecticides, no remedy can be suggested for the treatment of infected plants. We suggest the immediate removal of any wilting plant and the subsequent spraying of the remainder as soon as possible with poisoned Bordeaux mixture. This measure is entirely directed against further insect injuries and is of no use as a treatment for the wilt itself. Where speedy action is taken, the disease may be much restricted.

POWDERY MILDEW OF GRAPES (*UNCINULA NECATOR*, [SCHW.] BURRILL)—(THE *OIDUM TUCKERI*, BERK. OF EUROPE.)

This malady was first observed in the United States, but it is also common in Canada. In about 1845 it appeared in England and a little later in France and other European countries.

Appearance and Cause.

The powdery mildew appears in form of white flour-like patches on both sides of the leaves. The young shoots and flowers and fruits are equally liable to be attacked as soon as they begin to form. When any of the mildewed portions are rubbed between finger and thumb, a very peculiar musty odour will be noticed. The attacked

parts soon become brownish under the mildewy covering, and the leaves shrivel and die. In severe attacks, no fruit is produced. Moist weather favours the development of the fungus to which Powdery Mildew is due. Under the microscope, the powdery patches are recognized as being formed by the dense grayish-white masses of the fungus, the so-called oidial stage; later on there appear in the whitish patches numerous minute, globular conceptacles in which another form of spores (*Uncinula*) are produced.

FIG. 4—Powdery mildew on grapes *(Uncinula necator)*. The berries shrivel and burst open. (From Bulletin 38, vol. III, Purdue University).

Prevention.

It is advisable, where the disease has occurred, to prune the vines in the ordinary way in fall, as soon as the wood has sufficiently ripened. Prepare the following paste and apply with a stiffish brush to the vines, taking care to well 'paint' the whole of them. The soil should be removed round the base of the plants and the following and should be applied as far down as possible. Add slowly under constant stirring enough water to three pounds of common stone lime, that a very thin paste is formed. Then add to this, eight ounces of flowers of sulphur, stir and mix well and apply to the vines. In the early spring, a 2 per cent solution of Bordeaux mixture

should be applied as soon as the first three leaves have been developed. Do not spray vines during sunny weather but preferably on cloudy days. Should any mildew become noticeable thereafter, moisten all parts with a fine water vapour and dust well with flowers of sulphur, covering carefully all parts of the plants. Make it a practice to burn all leaves and wood that are cut off from the old vines.

DOWNY MILDEW OF GRAPES (*Plasmopara viticola*, Berk. *et* Curt.)

This form of mildew attacks practically all kinds of wild and cultivated vines. It may attack any part of the vines, but is more generally confined to the leaves. They are covered by a similar powdery substance to that described in the former disease, but it may be readily distinguished by the peculiar crinkling or blistering of the leaves where attacked. The fungus is not related to the former; it generally appears during the early summer and continues its destructive work until very late in the season. The whitish powder of this mildew is generally noticeable on the

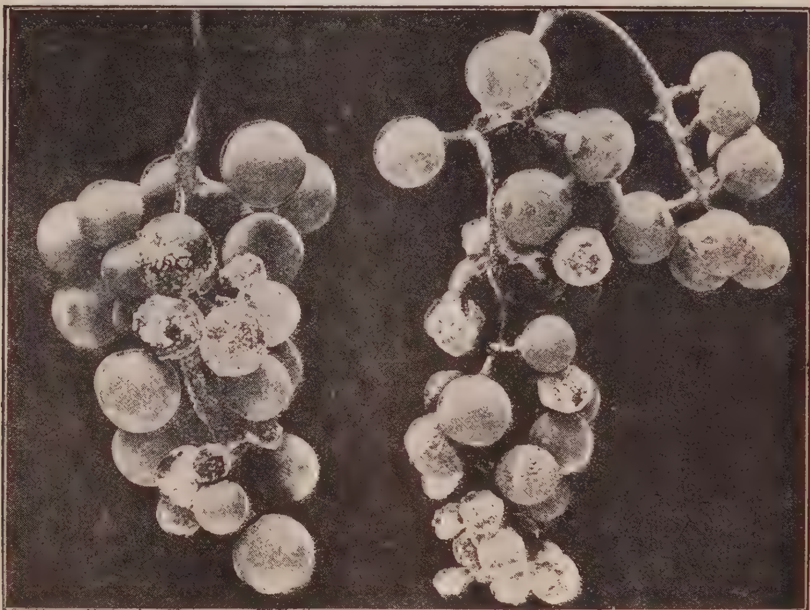


FIG. 5—Downy mildew on grapes (*Plasmopara viticola*). The berries are covered by the mildew. (Frontispiece Fungous Diseases Dugger).

lower surface of the leaves. In the early stages, one may observe on the upper surface yellowish to brownish discoloured spots, and soon the mildew becomes recognizable on the lower surface, corresponding to the spots on the upper. The patches rapidly increase in size and soon cover the whole leaf which becomes brittle and is finally killed. This mildew is very conspicuous on the berries, covering them over with a dense layer of filaments. While in the former mildew, the winter stage is produced on both surfaces of the leaves, here thick-walled resting spores are formed in the tissues of diseased leaves and shoots. The immediate destruction of any infected material is thus a very important factor in preventing the spread of this parasite of vines.

Prevention.

Besides destroying all infected material, periodical sprayings with Bordeaux mixture have proved very effective in checking this disease. Spray in the fall with a 4 per cent solution and begin spraying with a 2 per cent solution as early as possible in spring, continuing to spray the vines periodically with an interval of from five to six weeks, about six or seven times.

The following mildews are common on the specified plants and, as their appearance and treatment is similar, they may here be referred to in a more general way:—

Rose Mildew (*Sphærotheca pannosa* [Wallr.], Lev.).
Peach Mildew (*Sphærotheca pannosa* [Wallr.], Lev.).
American Gooseberry Mildew (*Microsphæra Grossulariæ* [Wallr.], Lev.).
Strawberry Mildew (*Sphærotheca Humuli* [De C.], Burr.).
Mildew of Apple, Plum and Cherry (*Podosphæra Oxyacanthæ,* De Bary).

Also attacking hops, melon, cucumber, and a number of wild plants.

The different fungi named above, and a few additional ones that occur more commonly on cereals, grasses and wild plants (*Erysiphe graminis,* &c.), cause the most common mildew diseases in a large number of plants. They are nearly all included in one group of parasitic fungi known as the *Perisporiaceæ.* The injury is due, in almost all cases, to the conidial stages of the fungi appearing as the whitish covering that is so conspicuous on the leaves of attacked plants. Flowers of sulphur has so far been found the most beneficial specific to apply in order to check most of the mildew diseases. Indeed, if carefully applied, that is, dusted on both sides of the leaves of trees or shrubs by means of a powderizer, following a wetting of the plants, the cure is almost certain in such cases as the rose mildew, peach mildew, &c. We are of the opinion, however, that the lime-sulphur wash should be mainly employed, as soon as any kind of mildew is prevalent. Generally three applications will be found sufficient to check the progress of the mildews. In orchards kept scrupulously clean and well sprayed, mildew diseases have very little chance of existing and causing much damage.

INJURIES TO VEGETATION DUE TO ATMOSPHERIC AND OTHER PHYSICAL CAUSES.

(Heat, Frost, Hail, Etc.: Injuries.)

The Division of Botany frequently receives specimens of various kinds of vegetation which appear to be injured, but in which parasitic agents are entirely absent. These injuries are generally due to mechanical or physical causes, as is proved by microscopical examination of the specimens. We may here distinguish injuries readily recognizable, such as breakages in the trunk of trees through stormy weather or sleet storms, frost cracks, and many others. Besides there are such injuries as only become prominent as the plant grows, i.e., frost injury to dormant buds, scalding of leaves and bark by sun, hail injury, &c. These injuries may more or less affect the life of trees and other plants, owing to the fact that very little if anything can be suggested to prevent them. We must bear in mind that many fungi, otherwise harmless, may seriously attack plant life where any wound surface, left unattended, offers them suitable places for their development. Thus after severe storms, during which branches of trees were broken off, the owner should immediately remove them with a sharp knife and attend to the wounds by coating them with tar or paint. While this may be useful in cases where injuries to large limbs have occurred, no such means prove of success in treating wounds that may be due to hail or sun-scald. These wounds are often very minute and imperceptible, but they are large enough for the spores of many fungi to enter and cause serious injury. The careful fruit-grower who has

experienced any of the possible results from hail injury would resort to spraying his orchard immediately after a severe hail fall. The wounds would thus be covered over with a fine film of the spraying solution used and fungus spores would be prevented from germinating on them. The wounds, thus protected would be unaffected, and would be afforded an opportunity of healing. The process of healing over begins almost immediately after an injury is done. Microscopically, one is able to trace the first signs of this process after two or three days. Though this is the case, one must remember that some fungus spores germinate after a few hours, and hence care should be taken to act in advance of the fungi. Frost has been known to do great damage to fruit trees, but it has been recorded that less injury was done to trees which had been sprayed with slaked lime or lime and sulphur wash. The lime being a bad conductor of heat or cold undoubtedly acts as a protection to the plant tissues underneath. The term 'winter killing' is applied to various injuries due to frost. One of the most important is the so-called 'black heart' or 'black core,' which cannot for some time be noticed externally. We have often traced this peculiar blackening of the centre of branches to wounds from which it spreads a few inches in both directions up and down the branches every year. Subsequently, the branches produce smaller leaves, bear no flowers, and finally die. When, in pruning the orchard, black-hearted branches are observed, it is recommended to cut these right back to the healthy wood and always close the cut with some kind of protective dressing.

In some countries, fruit-growers have resorted with much success to the lighting of a number of fires in their orchards to prevent any possible effects from the late spring frosts, when much damage would result to the opening buds or flowers. These fires are supplied with damp straw or leaves to produce huge volumes of smoke, which, on account of the steadiness of the atmosphere generally preceding cold, frosty nights, spreads slowly and closely over the ground and envelopes the orchard in dense smoke. The fires are kept up during the night, and serious damage has been averted as judged by comparison with orchards where no smoking was practised. After a little experimenting, the grower will soon discover how many fires will be needed to protect his plantation. It is generally not necessary to smoke the whole orchard at once, but select those portions planted with trees which are just starting to blossom.

WHITE PINE BLISTER RUST (*Peridermium Strobi,* Klebahn).—RUST OF GOOSEBERRIES AND CURRANTS (*Cronartium ribicolum,* Dietr.).

The Division of Botany received in August, 1909, the following intimation, by the courtesy of Dr. Haven Metcalf, of the United States Department of Forest Pathology:—

> According to advices received from the American Consul-General at Hamburg, Germany, a shipment of 250,000 white pine seedlings was made by J. Heins Söhne, of Halstenbeck, to the Ontario Agricultural College, Guelph, Ontario, in 1907. As this is the firm which shipped all the trees in America which are known at present to be diseased with *Peridermium Strobi,* this shipment to Ontario should be very thoroughly and carefully investigated, and any disease found eradicated.

It is remarkable that in the original home of the White Pine (Northern America) the so-called White Pine Rust is so far unknown. This rust has worked great havoc amongst young pine plantations in Europe and it occurs also on older trees. Not only is the life of the White Pine endangered, but, as is regularly the case with rust fungi, the fungus causing white pine rust passes through another form of its life history on leaves of cultivated and wild species of gooseberries and currants and is capable of inflicting serious losses in these fruits. In order that the rust may readily be recognized and its eradication proceeded with we give here a careful account of the disease and recommend every one to be on the lookout for it.

When pine trees are affected by the disease, the stems of the young trees or the branches of older ones will show a number of prominent orange-yellowish pustules, between which masses of white resin are seen oozing out from underneath the bark. Unfortunately the spores which cause these orange cushions are not always present on the stems, although the plant may be affected. With a little more careful observation, one may discover a more or less longish swelling or blister, generally covered with resin. When either the orange spore pustules or the swellings of the stem branches are found, it would be advisable to send specimens immediately to us for examination and report. As it was pointed out, the fungus passes through another stage on gooseberries or currant bushes that may be in close proximity to attacked White Pines. The spores originating on the White Pines produce similar orange-yellow spots, like the rust of wheat, on the leaves of currant and gooseberry bushes. The foliage, if badly attacked, easily falls to the ground and the fruit is arrested in its development or ripens prematurely, being in either case much inferior in quality. Towards the end of summer, a new form of spore is produced on these leaves by which the fungus returns to the pines to start upon a new life cycle.

It will be seen that the introduction of this rust would seriously compromise the white pine industry of the country and also be of considerable consequence to the grower of these berry bushes, and it is hoped that all persons concerned will be on the watch and quickly report any suspected outbreak.

On communicating with the Agricultural College of Guelph we ascertained that all possible precautions were being taken. The young pines have been planted in nursery lines at the Guelph College Forestry Station in Norfolk county and are carefully watched. The authorities of Guelph have, in view of the considerable quantity of white pines which they have imported during 1908 and 1907, and which are kept under 'quarantine,' eradicated all species of Ribes within a considerable distance of this field and in fact have destroyed currants and gooseberries throughout this locality. The forestry expert at Guelph has also informed us that amongst the trees for distribution this year there are not included any white pines. We may thus hope that the White Pine Rust will be prevented from establishing itself in Canada.

WEEDS.

While the Division is ready at all times to assist collectors of plants in naming their specimens, yet its primary aim in offering to name plants is to be of use to farmers in identifying the weeds which are troubling them and to advise them in the matter of weed eradication and control. It is an encouraging indication of their interest in weed problems that so many of them have availed themselves of the service offered.

It is very desirable that correspondents, when sending weeds for identification, should give some idea as to their abundance. We call attention to this for the express purpose of urging that more care be taken in future to state fully the facts of the case along with each inquiry. We can never give as useful a reply to a letter which contains no particulars as to one which tells us something about the crop which is infested, the nature of the soil, the system of farming followed, &c. If we knew, for instance, that a certain weed sent was giving trouble in pasture land which could not be brought under cultivation, our advice might be very different from that which we would give for fields under regular crops. Specimens should accompany all inquiries so that we may be certain what we are dealing with.

The majority of the weeds received during the year are such as occur in similar abundance at any time, in the localities from which they have been sent, and there is nothing exceptional about their occurrence to call for special notice here. There are several, however, to which, for one reason or another, some reference should be made

WEEDS RECENTLY INTRODUCED OR ATTRACTING ATTENTION.

Field Pepper-grass (*Lepidium campestre,* [L.] R. Br.) and Rocket (*Eruca sativa* Lam.) are two weeds which are being reported with increasing frequency each year, the former being introduced mainly in clover seed, and the latter, at least in every case concerning which we have received particulars, in lucerne seed. Both plants are native to Europe, and bid fair to become established weeds with us. Field Pepper-grass is a coarse biennial, with numerous stems densely covered with somewhat stem-clasping arrow-shaped leaves. Unlike the common Pepper-grass, the whole plant is downy with short white hairs. Its pods are also larger, and curiously spoon-shaped. The other weed, Rocket, was first reported in Canada in 1907. Roughly speaking it resembles Wild Mustard, but it is readily distinguished by its deeply-cut leaves, with large terminal lobes, its purple-veined, light yellow flowers, and its short, broad-beaked pods. Where these weeds are found to have been introduced in a seeding, it will be safest to go over the infested fields and pull all that are found. Early cutting of the hay will also help to prevent the maturing of the seeds, but the mowing will have to be repeated later to destroy the new shoots which are immediately produced by both weeds.

In Quebec and the Maritime Provinces, several species of Hawkweeds, (*Hieracium*) notably the Orange Hawkweed or Paint Brush and the Mouse-ear Hawkweed, are giving farmers much trouble. They are most commonly reported from pastures, and when such land can be broken up and worked under a short rotation of crops, it is possible to control these weeds, otherwise they are very difficult to deal with, if they have once spread over any great area. In Ontario, most concern has been shown over the rapid spread of Perennial Sow Thistle. In view of the persistence of its creeping rootstocks, and the facility with which it spreads its seeds, its control is without question a serious problem. Spring cultivation followed by a smothering crop, and a cleaning crop the next year, is perhaps the most satisfactory method of eradication to employ, or a complete summer-fallow may often be advisable.

COMMON HORSETAIL (*Equisetum arvense,* L.) AS A STOCK POISONING PLANT.

(Plate 2, Fig. 1.)

In December, 1909 a bale of hay was received at the Experimental Farm from Beauce county, Quebec, with the complaint that cattle feeding on it had shown symptoms of poisoning. An examination of this hay proved it to be of exceptionally inferior quality, and evidently obtained from a wild undrained meadow. Its bulk was composed largely of a sedge (one of the varieties of *Carex stellulata*); there were also present in smaller quantities, about a dozen agricultural and wild grasses and clovers, several other sedges and rushes and at least three dozen weeds and wild plants, useless for hay. By carefully examining the herbage, my assistant, Mr. Groh, discovered in the inflorescences of *Carex stellulata,* the presence of Ergot grains. This is of double interest, partly because Ergot was hitherto unknown to occur in the genus *Carex* and partly because of its known poisonous properties. By actual analysis of ten pounds of the hay, the proportion of weedy to useful plants (including the sedges among the latter) was found to be about one in eight. The presence of so large a proportion of weeds was in itself sufficiently objectionable; but the main danger in feeding the hay, doubtlessly had arisen from a large amount of Horsetail contained, a weed which has been quite conclusively proven to have poisonous properties. From Europe and the United States, feeding experiments are reported in which horses, fed on hay containing one-quarter its bulk of Horsetail, developed characteristic symptoms of poisoning and ultimately died. No doubt was left as to the responsibility of the Horsetail as the cause of the trouble. The opinion is expressed by American experimenters that other animals are less readily affected, and cattle in particular

are not so likely to suffer. The results of European investigations, however, show that they may also be poisoned. Although no opportunity has been had in this case, to investigate closely, yet the Horsetail present in this hay may be safely held responsible for the injurious effects reported.

Horsetail is a common weed everywhere, growing by preference in sandy soil which remains moist by reason of a shallow water table. Railway embankments through swampy land, are almost invariably covered with it, but fields and pastures may also have it in quantity. Its appearance in one or the other of its stages, is familiar to most people, but many are not aware that these different forms belong to the one plant. The first stems to appear in the spring are thick, pale and unbranched; and have loosely-fitting toothed sheaths at intervals, and cone-like tips which are the so-called fruiting organs containing the spores. A little later, other stems are sent up from the same creeping rootstocks, being bushy with slender, whorled branches and green throughout. These branches are merely vegetative, while the first, producing the spores, serve to disseminate the plant. It also spreads by means of its rootstocks.

The presence of horsetail in fields in the majority of cases indicates a need for drainage, and this defect being remedied, there is not usually much difficulty in overcoming it with cultivation. In pastures, where cultivation is out of the question, there is little that can be done except good drainage; but apparently less is to be feared from its presence there than where it gets into hay, as its virulence seems to be increased by drying. If stock must be pastured where there is any of the weed, a close watch should be maintained for any symptoms of trouble. Among the symptoms of poisoned animals, the first noticeable is unthriftiness; and in from two to five weeks the animal begins to lose control of its muscles, swaying and staggering about until finally it goes down under the increasing violence of muscular contractions. Up till this time it eats well, and seems otherwise bright and active. Cases of poisoning in this country have not in many cases been traced to Horsetail; but thorough and immediate *post mortem* examination would likely show that many obscure cases have been really due to this cause.

Destruction of Wild Mustard by Chemical Sprays.

During the year, considerable interest has been shown in the use of chemicals for the destruction of various weeds, or of weeds in general. There is something alluring in the thought of carrying on the fight in this way, instead of by the backbreaking use of the hoe, or by persistent attention to cultivation, hence the desire for information. Up to the present, we regret to say, experience has not justified us in looking to sprays for our solution of the general weed problem, as there are only a few weeds against which they have been successfully employed; and there are practically none, except wild mustard, for which we are yet prepared to recommend the spray method of treatment. As a treatment for mustard, however, it has been in use by farmers to a limited extent for a number of years, and there is no good reason why it should not be far more widely practised. Together with correct farming methods, it makes the control of this much too prevalent weed thoroughly practicable. It is not intended that spraying should take the place of cultural methods, but only that it should be an additional means of preventing the seeding of the weed, while infested land is being freed from the seeds already in it. Every effort should be made to destroy the seedlings by cultivation, before and after the period when the crop is occupying the field, but any progress which is made will be immediately lost if the mustard growing with the crop is allowed to mature its seed, and it is to prevent this that the spraying is recommended. It enables the farmer to fight the foe without giving up the use of the land in the meantime.

The spray which has been longest in use in Canada is a 2 per cent solution of copper sulphate in water, about fifty gallons to an acre being required. More recently

iron sulphate has been experimented with, and is claimed to be equally effective, and somewhat cheaper. It is usually recommended to use about 75 to 100 pounds of iron sulphate in fifty gallons of water, according to the succulence of the plants. Recent experiments in Germany have shown that a 14 per cent solution, which amounts to 70 pounds to fifty gallons of water is sufficient. Iron sulphate is much cheaper than copper sulphate, so that even the larger amount used does not make its cost so great. The solution must be applied in a fine and forcible spray so that it may cover the greatest possible area and at the same time cover the foliage thoroughly. For this purpose some form of a power spray is necessary. An arrangement which is often

FIG. 6.—*a*. Flower. *b*. Pod of Wild Radish *(Raphanus raphanistrum.)*
c. Flower. *d*. Pod of Wild Mustard *(Sinapis arvensis L.)*

Both plants are often mistaken for each other, but they are readily distinguished by the light yellowish flower, the tube-like calyx and segmented pods of wild radish (*a* and *b*) and the dark golden yellow flower, the open calyx and the splitting pods in the wild mustard seed.

used by large potato growers and which can be readily adapted for mustard spraying, is a spray pump with a barrel mounted on a cart, and having the necessary attachments for a series of nozzles to cover the desired width. Such a spray pump, where not already a part of the farm equipment, would be found to be a useful investment for such purposes.

The time to spray is a matter of importance, as there is little use in going to the trouble and expense of the operation after the mustard is once well into bloom. The flowers are much less easily injured than the leaves, and can often derive enough nourishment from the stems to mature the seed. The work should be done as early as possible after the mustard has all commenced to grow, and can be seen in the grain. Should rain fall immediately after spraying, much of its effectiveness will be lost;

therefore the probable weather for the next day or two should always be taken into account.

It may be as well to explain that spraying for mustard should not be attempted in crops other than the cereals. The narrow, smooth and minutely hairy leaves of the common grain crops, and the fact that the growing point is at some distance within the leaf sheaths, protects them from being easily injured, but clovers and other plants are not so safe. The possibility of destroying mustard in growing grain crops depends on this difference between them and its broad, rough, and succulent leaves.

Grass and Clover Plots.

Farmers visiting the Central Experimental Farm frequently wish to see certain grasses or clovers about which they have heard satisfactory reports. For this purpose the late Dr. Fletcher had started experimental plots showing the most important native plants, suitable for hay or fodder. These plots by means of comparison often demonstrate clearly the value of the various plants for special yield per acre and, valuable conclusions may be drawn from these experiments. We also endeavour to supply information as regards the most suitable mixtures for hay or pasture land. Plots have been arranged to demonstrate the difference in appearance between 'Chess' and Wheat. Although it has been frequently proven that 'Chess' is a totally different grass from wheat and that the mysterious changes from wheat to chess never take place, there are some who are not yet convinced. Hence the plots show, especially early in the season, the characters of the different plants very well and are found very instructive. 'Chess,' (*Bromus secalinus*) is an annual grass which reproduces itself rapidly by seeds. We found that when sown in autumn and when wintering well, it has produced as much as eighteen tons of green herbage per acre. When cut before ripening its seeds, it is a fairly satisfactory haying grass.

The Herbarium and Systematic Botany.

Whenever opportunity has offered, especially during the winter months, the work of enlarging and improving the Herbarium of the Division has been proceeded with. Many species of plants which the collection lacked, have been added; and over one thousand sheets in all have been prepared and were added during the last eighteen months. These were secured mainly from (1) unmounted collections, mostly from the western provinces, made by the late Dr. Fletcher on his annual trips to the west; (2) collections, mostly of weeds, and plants of the open country, made in the neighbourhood of Ottawa during the summer of 1909, and (3) plants received from correspondents for identification, or as donations. The consultation of the Herbarium has been much simplified by re-arranging it according to the classification of Engler and Prantl, which is at present the most satisfactory, and which is adopted by the most recent Floras. The separate specimen sheets have been placed in new and more convenient wrappers, and the whole collection has found accommodation in a new and larger cabinet where it is more readily available for reference.

The necessity for a good reference collection, such as is being gradually built up, will be apparent, when it is stated that about forty collections of from half a dozen to three dozen plants each, were received during the year for naming, from teachers, and others, besides weeds and other specimens sent singly or in small numbers. The identification of this material has taken much time, especially when, as is too often the case, immature plants, or only parts of plants are sent, or when the specimens arrive in poor condition, owing to lack of care in packing. Correspondents would much facilitate our work, and often enable us to give fuller information, if they would bear this in mind. Specimens should be taken in flower whenever possible, the whole plant being preferable if it is not too large, and they should be either dried under

pressure before sending, or be packed within large leaves of some kind which will keep them fresh until they reach us.

In concluding, it gives us pleasure to acknowledge our indebtedness to Prof. John Macoun, and to Mr. Jas. M. Macoun, of the Geological and Natural History Survey, for their kind assistance in identifying specimens not contained in our own collections, particularly of western plants.

REPORT OF THE POULTRY MANAGER.

A. G. GILBERT.

OTTAWA, March 31, 1910.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the pleasure of submitting to you herewith the twenty-second annual report of the Poultry Division of the Central Experimental Farm.

Before giving a detailed description of the experimental work of the past year, certain features in connection with poultry production which directly affect the egg and poultry trade of the country are noted. The more important of these features may be enumerated as follows:—

An increasing scarcity of strictly new-laid eggs and of the beter quality of poultry, and reasons therefor.

Official figures are given which not only show declining exports of eggs and poultry, during the past five years, but increased imports of both commodities.

The opportunities which many farmers have of reaching the high-priced markets for eggs and poultry are commented on.

Practices on the part of some farmers in marketing eggs and poultry which prevent them from receiving the highest prices for the same are noted and remedies suggested.

The remarks of one of the largest egg and poultry buyers in Canada who states that farmers 'lose money by holding their eggs too long,' are quoted.

It is shown how a better quality of eggs and poultry may be produced by the adoption of methods which have been successfully practised in our Division for several years past.

Proper rations for laying hens and growing chickens, which are frequently asked for, are described at length.

The experimental work of the year was of its usual varied character. Among its most important features may be mentioned the following:—

Continued work in the selection, by trap nest records, of the best laying fowls.

Experiments to determine the beneficial effects of breeding from fowls of proved egg-laying worth.

The egg-laying records of fowls kept in warm and in unheated houses are given and compared.

The results of hatching by natural and by artificial means are stated.

The successful use of electricity in the hatching of chickens.

I have again the pleasure of acknowledging the assistance of Mr. Fortier in carrying on the experimental work of the year. The tables to be found in the following report, which were compiled by him, give the results of the experiments conducted under his immediate supervision. During the year, his services were called for, as poultry judge, at L'Assomption, Sherbrooke, Knowlton, Montreal, St. John's, Victoriaville and Quebec City, in the province of Quebec, and at Alexandria, Ont. He also delivered addresses at three Farmers' Institute meetings in the province of Ontario

and at eleven meetings in the province of Quebec. His attention was also given to a large correspondence in French.

Mr. R. Pelletier, who last year was appointed stenographer and typewriter to this Division, is entitled to credit for despatch and efficiency in handling a large number of letters in both English and French, received and sent out.

Mr. Summers, to whom was entrusted the collating of trap nest results, the feeding of experimental rations and other experimental work, was capable and correct.

Mr. Deavey was energetic and successful in keeping the different poultry houses and grounds in good order, as he was in caring for the laying stock during winter and the young chickens in summer, from the time of hatching until maturity.

I had the pleasure of attending, during the year, the following farmers' meetings and poultry shows:—Poultry meetings and show at the Industrial Exhibition, Toronto; Fat Stock and Poultry Show at Guelph, Ont.; Poultry Show at Russell, Ont.; Poultry Institute meetings at Guelph; Poultry meetings at Charlottetown and Marshfield, P.E.I.; Farmers' Institute meetings in Ontario; Ontario Fair Association annual meeting in Toronto, and other meetings at Carleton Place, Ont.; Kinburn, Ont., Truro, N.S., Moncton, N.B. and Macdonald College, Quebec.

A large and increasing correspondence, in both English and French, was an interesting feature of the year's work. The number of letters received during the year were 4,834, and the letters despatched totalled 5,773.

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,

Manager, Poultry Division.

REPORT OF THE POULTRY MANAGER.

A conspicuous feature in connection with the production of eggs and poultry during the past year was the scarcity and high price of both products. This was notably the case during the fall and early winter months. The shortage at these periods may be traced to any, or all, of the following causes, namely:—

1. A cold and protracted spring, which seriously retarded the hatching of early chickens.

2. As a result of late hatching, the chickens were slow in growing and there was a demand for eggs and poultry in the fall months, before either the pullets had sufficiently matured to make early layers or the cockerels were in fit condition for sale for eating purposes.

3. In sympathy with the backward season, the older hens were slow in moulting and, in consequence, late in resuming egg-laying.

The protracted cold weather with its retarding influence on the early production of eggs and poultry was more general than was at first supposed. This was indicated by numerous letters received which described a similar state of affairs throughout many different sections of the country. Writing on the situation, the *Globe* of Toronto of December 7, 1909, editorially remarked: 'Quotations from various centres of prolific production show prices ranging from thirty to fifty cents per dozen, and in Toronto it is confidently prophesied that before the winter is over the price for strictly first-class eggs will be soaring in the neighbourhood of a dollar.' While the latter figure was reached in a few instances only, exceptionally high prices for strictly new-laid eggs were certainly obtained in Toronto and in other leading cities. Writing on the prevailing scarcity, the editor of the Stratford *Beacon* the first week of December last asks: 'Why should there be such difficulty in obtaining new-laid eggs in winter when the Experimental Farm Poultry Department of Ottawa has practically shown that well-fed and cared-for hens will lay well during the winter season?'

The writer of the foregoing might have added that the demand was not only for strictly new-laid eggs, but for the better quality of poultry.

Some Interesting Features of the Situation.

It is not likely that the shortage of the better quality of eggs and poultry, so acutely experienced during the past season, will be satisfactorily met until the farmers of the country give more attention to the poultry branch of their farm work. The remedy is in their own hands. That more farmers are taking greater interest in egg and poultry production is beyond question, but that their number is too limited is proved by the fact that prices have become greater rather than less. The demand is actually increasing more rapidly than the supply. The poultry and egg market in Canada is described as being unique, for the reason that, for some years past, we have had decreased exports, increased production, but, withal, increased prices. The explanation is that we have a home market of rapidly increasing value, to the requirements of which there is inadequate response. The following figures, kindly furnished by the chief officer of the Census and Statistics Office at Ottawa, show the decline in the export of eggs and poultry from Canada during the years 1905 to 1909 (both years inclusive), and the increase of imports into this country of both products during the same period:—

EXPORTS OF EGGS (HOME PRODUCE) TO ALL COUNTRIES IN THE FISCAL YEARS 1905-1909 INCLUSIVE, VALUE PER YEAR.

—	1905.	1906.	9 mos., 1907.	1908.	1909.	—
	$	$	$	$	$	
Eggs..................	712,866	495,176	556,557	301,818	124,315	A decline of $588,551 within five years.

EXPORTS OF POULTRY TO ALL COUNTRIES DURING ABOVE YEARS.

Game and poultry, living and dead....	181,874	217,944	157,677	222,012	112,579	A decline of $69,295 in five years.

VALUE OF IMPORTS OF EGGS AND POULTRY FOR HOME CONSUMPTION IN THE FISCAL YEARS 1905-1909.

Eggs..............	67,559	82,937	143,184	214,994	239,127	An increase over amount imported in 1905 of $171,568.
Poultry and game..	41,400	48,494	47,956	61,762	59,483	An increase over amount imported in 1905 of $18,083.

THE DEMAND IS FOR BETTER QUALITY.

It is worthy of note that the rapidly increasing demand of the home market is for the better quality. There is an abundance of the unreliable and undesirable in eggs and poultry, but the inferior article is not wanted. It is dear at any price. For the superior quality, consumers are willing to pay the best prices, but, in return, they demand the choicest articles. At an agricultural meeting held during the past winter, one of the speakers, referring to the scarcity of the better quality of eggs and poultry, remarked: 'A great difficulty in the production of the best quality is that the farmer is not interested. In order to overcome this difficulty, the farmer must be educated to the needs of the produce market as something must be done to meet the needs of an ever-increasing demand for the superior quality. In five years we should have 25,000,000 hens to meet the estimated requirements of the market of that day.' It is gratifying to realize that the work of education referred to is surely and steadily being carried on by means of lessons and literature from our Experimental Farms system, by education at agricultural colleges and by the agricultural press. The farmers of the country have only themselves to blame if they do not know how to make the poultry department of their farms profitable.

THE GREAT BULK OF THIS SUPERIOR QUALITY SHOULD COME FROM THE FARMERS.

It has been pointed out in previous reports that the great bulk of the supply of eggs and poultry must inevitably come from the farmers of the country. And this supply is not as likely to come from the few farmers with a great many fowls each as it is from the many farmers with comparatively few hens each. The production must be general. A certain quantity of strictly new-laid eggs and of a better quality of poultry will doubtless come from poultry keepers, who usually locate in the outskirts of cities and large towns. These producers are in close proximity to the best customers, from whom they receive the highest values for the choicest articles. But

they are comparatively few in number and should not prove serious rivals to the farmer who is in a position to produce much cheaper and in greater quantity and so command the market. But until the farmers—especially those near the markets of highest prices—fully realize their opportunities and take advantage of them, so long will the specialist poultry-keeper of the city produce the much desired new-laid eggs and receive the highest prices for them.

A GREAT DRAWBACK TO FARMERS OBTAINING HIGHEST VALUES.

There are two serious drawbacks to farmers obtaining the best prices for eggs and poultry. These may be stated as follows:—

1. The pernicious habit of saving up eggs until a sufficient number is collected to make it 'worth while taking them to market.' The usual result is that the eggs first saved up are stale before reaching the purchaser.

2. An inferior quality of poultry is too often the result of allowing the young chickens 'to pick up their own living,' and in so doing develop bone, sinew and muscle rather than flesh. On a following page, it is shown how the better quality of eggs and poultry may be secured.

The difficulty of obtaining reliable eggs usually experienced by the city purchaser calls forth the following remarks from the Toronto *Globe* of December 7, 1909: 'Why should there be such a thing as stale eggs? The hen herself is as honest as she is industrious, and never has been known to lay a stale egg. And yet so much does the stale variety outnumber the fresh that it would not be an exaggeration to state the proportions as five to one. The cause of deterioration requires no profound search. The machinery for conveying it from the nest to the breakfast table is defective. While millions of fresh eggs are being brought into the world every day, there is no task that demands more vigilance on the part of the housekeeper than to get half a dozen of immaculate character to put on the breakfast table. Who will deal with this larger question? How can the law of supply and demand be made more rapid and efficient? Why stale eggs when the hens are filling the nests with fresh ones?' This grievance, noted by a leading journal of the country, is unfortunately too common in almost all cities in Canada. As already remarked, the remedy is in the hands of the farmers. They should make it a strict rule to sell on the market, to store-keeper or to private customer, none but eggs which are strictly fresh. This may be done by disposing of the eggs at least once a week and oftener, if opportunity permits.

WHAT A LEADING BUYER SAYS.

Mr. John A. Gunn, of Messrs. Gunn, Langlois & Co., Montreal, one of the largest egg and poultry purchasing firms in Canada, in a recent address before the members of the Poultry Producers' Association of Eastern Canada, said: 'It is estimated, and I think as nearly correct as possible, that there are, on an average, two dozen rotten eggs to every case, taking the season throughout. This does not include those called seconds nor the loss consequent upon cracked or broken eggs. There is no possible shadow of doubt but that fifty-one per cent of the rotten eggs could be eliminated, and if this could be done, taking eggs at eighteen cents per dozen, which was the average cost for the past season, I estimate that there would be a saving to the farmers of Canada of well over half a million dollars.'

And as to the cause for this regrettable state of affairs, Mr. Gunn said: 'Let us look for the cause. Reverting to our correspondence and also from personal knowledge, we know that a large percentage of the blame rests with the farmers. Why? For the reasons:—

1. Some farmers deliberately take to the store eggs which they know are not fresh, because the merchant is compelled to take them or lose their business.

2. Farmers take bad eggs to the market because of ignorance as to the quality of the eggs.

The foregoing remarks—from the senior partner of one of the largest wholesale egg and poultry purchasing firms in the Dominion—should be taken into serious consideration by the farmers of the country. It has been shown on a previous page that the demand for eggs and poultry of the superior quality is becoming greater every year.

CONDITIONS THE FARMERS SHOULD BE ACQUAINTED WITH.

The farmer who desires to take advantage of the rapidly developing egg and poultry markets should be fully cognizant of the following conditions which have so much to do with success, namely:—

A.—An appreciation of the fact that the requirements of the high-priced markets are for strictly new-laid eggs and a superior quality of poultry only.

B.—A thorough knowledge of how to produce the best quality of eggs and poultry wherewith to cater to the markets of high values.

C.—A keen realization that only the best will bring the highest price. Stale eggs and thin and ill-fed poultry will not receive first consideration at the hands of purchasers.

D.—Clean and new-laid eggs of equal size and same colour, placed in neat packages, are in the greatest demand.

E.—The producer who earns a reputation for selling none but reliable eggs and a better quality of poultry is not likely to lack for customers.

F.—The producer who has the best quality of eggs and poultry is in a position to demand the highest prices. His goods will stand by him. Customers are likely to come to him again.

G.—The seller of stale or doubtful eggs is not likely to make a circle of permanent customers. He may sell once but he is not likely to sell again to the same person. He is not in a position to say, 'My goods will prove their worth.'

FACTORS IN THE PRODUCTION OF THE BETTER QUALITY OF EGGS AND POULTRY.

The question is frequently asked by correspondents and others, 'How may new-laid eggs and the better quality of poultry be produced and sold to the best advantage?' Experience of many years has shown that the observance of the following rules will likely lead to a satisfactory solution of this question, namely:—

NEW-LAID EGGS IN SUMMER.

A.—Strictly new-laid eggs for summer use should come from carefully and well fed hens.

B.—To have eggs of the finest flavour, the hens which lay them should not have access to decaying animal or vegetable matter.

C.—The eggs should be non-fertilized, especially in the summer season.

D.—The nests in which the eggs are laid should be scrupulously clean.

E.—The eggs should be collected frequently and placed in a well-aired cellar or cupboard.

F.—The eggs should reach the consumer as soon as possible after being laid. The limit should not exceed a week. Better if it is only four days.

G.—For a choice retail trade, the eggs should be clean, of large and even size, and packed in neat boxes to hold one dozen each. If sold in larger quantities they should be carefully packed in clean crates. The object is to have the eggs present an

inviting appearance. Leading purveyors say that eggs so put up are most readily sold.

WINTER EGGS OF THE BEST QUALITY.

A.—Will be laid by hens which are fed on a variety of food, are free from vermin and have a well-ventilated and clean poultry house to lodge in.

B.—Eggs should be collected before they are frozen. An egg frozen and thawed out loses its flavour.

C.—They should be sold to private customers, city dealer or placed on the market within ten days of being laid.

D.—After being collected, they should be placed in a well-aired and sweet-smelling storing place.

TO SELL TO THE BEST ADVANTAGE.

A.—Select and send the choicest goods to a reliable dealer in the best paying market, which is usually a city one. (Express charges for eggs are two cents per dozen for short distances. A return charge of five cents per empty crate is made.)

B.—Some city dealers pay more for hens' eggs than for pullets', for the reason that the former are larger.

C.—The practice on the part of many farmers of holding eggs until they have a sufficient number to make it 'worth while' taking them to market, should be abandoned. It usually results in the eggs becoming stale and they are apt to receive a low valuation when sold.

D.—Farmers in the neighbourhood of cities have exceptional opportunities of reaching the best paying customers and obtaining the highest value for strictly new-laid eggs.

THE SUPERIOR QUALITY OF POULTRY.

The better quality of poultry may be produced by adopting the following methods:—

A.—Chickens must be of correct market type which implies that they must come from parentage of the same desirable type.

B.—After being hatched, the chickens require to be gently pushed by regular and generous feeding. How to correctly do so is shown on a following page.

C.—The too common practice of allowing chickens to 'pick up their own living,' or in any other way neglecting them, will seriously affect their growth and quality.

D.—Roomy coops, freedom from lice, new ground and cleanly surroundings are requisites for quick and healthy development.

E.—If the chickens are reared in brooders, care should be taken that they are not over-crowded. This undesirable treatment is too frequently the cause of disease and death.

F.—A robust chicken should eat heartily, grow well and be so handled as to put on flesh rather than develop sinew and muscle.

G.—Chickens should not be given any food for twenty-four hours before being killed. This will ensure their crops being empty of food when killed, a matter of importance.

FOWLS WHICH ARE BOTH GOOD LAYERS AND DESIRABLE MARKET TYPES.

Farmers and other poultry keepers who desire fowls which are both good egg-layers and acceptable market types will find any one of the following varieties most suitable:—

Barred, White, Buff or Partridge Plymouth Rocks.
White, Buff, Partridge or Columbian Wyandottes.
Buff, White or Black Orpingtons.

The Dorking family.

Rhode Island Reds.

The English market prefers a bird with a white skin of fine grain, flesh-coloured legs, in good condition and carrying a liberal quantity of breast meat, such as the Orpingtons, Dorkings, &c. The Canadian purchaser is not so particular as to colour of flesh as he is to the condition of the bird, but there is a growing preference—noticeably on the part of fastidious city customers—for the white and fine-grained flesh.

The Houdans and Faverolles, which are the best known in Canada of the French varieties, have also white flesh of fine grain and are fairly good layers.

As shown in reports of several years past, the trap nest is useful in showing the fowls which are the best layers in combination with market type. Having selected a variety from the list of fowls named, it is for the farmer or poultryman to keep intact, or to develop, the egg-laying power and market type of the birds of his choice.

The following illustrations show desirable market types:—

White Orpingtons.

Barred Plymouth Rocks.

INFORMATION ASKED FOR BY FARMERS.

Notwithstanding the information conveyed in reports of previous years on the different phases of poultry keeping, frequent inquiries continue to be made as to management of fowls and rations best suited to induce winter egg-production, also as to the treatment and food best calculated to secure the steady growth and development of the chickens from hatching to marketable age. The experimental work of many winters past has shown that the following are the most important factors in securing both objects:—

1. To secure satisfactory winter egg-production, the laying stock should come from parentage of excellent egg laying records. Where it is not convenient to use trap nests, careful observation will lead to the detection of the good layers.

2. The poultry house should be dry, well lighted and ventilated. It is not necessary that it should be artificially heated. Unheated and economically constructed houses to hold 20 to 25 fowls have given satisfaction during several years use in our Division. Plans of these houses may be had on application.

3. Birds of the utility varieties—as named on a previous page—are best for the farmer. If good layers, fowls should be kept, at least, until two years of age; if of an extra good egg-laying strain, for another year.

4. It is essential to profitable egg laying in winter and to the good health of the fowls that the rations should be of a varied nature. A varied ration embraces materials which make the yolk, the white and the shell of the egg, as well as green or vegetable food and a certain amount of animal food and grit, the latter being the material with which the hen grinds up the food in her gizzard. A varied ration should be easy to secure on a farm where different grains, roots or vegetables and, at times, meat or bones are usually found in good supply. A wholesome and varied ration need not be an expensive one, but it should be fed regularly. In feeding and

managing fowls for egg production in winter, it is well to bear in mind that, if kept in close quarters during that period, they require to be artificially supplied with what they can pick up for themselves while running at large during the open season.

A POPULAR RATION.

The following ration has been found most effective in our Division in the production of eggs during winter. It should be popular on the farm as it makes use of certain forms of waste:—

Morning ration.—Table and kitchen waste, which is usually in the shape of unused porridge, potato, turnip and other vegetable peelings. These should be cooked and with them should be mixed what ground grains can be conveniently spared. The whole should be mixed into a crumbly condition and fed morning or evening in the proportion of one and a half to two ounces to each hen, the latter quantity preferably, if given in the afternoon.

Noon ration.—A small quantity of oats to be thrown into the litter on the floor of the pens, to incite the fowls to exercise.

Afternoon Ration.—Throw one and a half ounces of wheat—to each fowl—in the pens. Feed early enough in the winter afternoon, so that the birds can see to search for it in the litter on the floor. Occasionally, the morning ration should be changed to whole grain and the mash given in the afternoon. While the rations may be varied, the time of feeding should be regular. Cut bone should be given in the proportion of two pounds to every 15 fowls, three times per week, at noon, when no other food should be given.

Mangels, beets, cabbage or other roots or vegetables with other essentials such as grit, broken oyster shells, and pure drinking water should be regularly supplied.

While there is no cast iron rule as to the exact sorts of grains to use in the mash, or to be fed whole in the litter, the grains used should be clean and wholesome, the feeding done at regular hours, and vegetables or roots and other essentials unfailingly furnished.

What is desired is variety, cleanliness and regular attention with intelligent observation as to the effect of food and treatment. Experience has plainly shown that where rations embracing such variety as the one outlined have been properly used, feather-picking and egg-eating have been prevented and a satisfactory output of eggs secured.

DIFFERENT FORMS OF SOME ESSENTIAL ELEMENTS OF FOOD.

There are different forms of some apparently insignificant elements of food which are, on the contrary, all-important essentials, namely:—

Lime for egg shell making may be had in the form of old mortar or oyster and other sea shells. Ground bones and the different grains also furnish a small percentage of lime.

Grit.—In the shape of sharp gravel; flint stones, broken small; broken crockery without slivers, or the ready-made mica, granite and other commercial grits, which are sold at poultry supply houses, or seed stores, at from 85 cents to one dollar per hundred.

Cut bone.—Bone may be had in the shape of beef heads, sheep heads or green bones from a butcher. These may be broken up, or cut up (not ground), by small mills called 'bone cutters,' which are sold from $7 to $25 each, according to size.

Green food.—Is usually to be had in plenty on a farm in the shape of clover hay, unmarketable vegetables or roots, ensilage, &c. An excellent form of green food may be had in the shape of lawn clippings, dried, and steamed when required for use in winter.

DIFFERENT METHODS OF FEEDING.

There are two methods of feeding in vogue at present, namely, the 'moist' and the 'dry.' The food in the first or 'moist' method is usually composed of ground grains which are mixed with hot water into a crumbly mash and then fed in small open troughs. The second method is known as the 'hopper system,' and has become popular as it is, to a certain extent, a labour saver. By this method, whole or ground grains may be mixed thoroughly together dry and put into the hopper. By this thorough mixing of the grain, variety, which is so desirable, is secured. Some patterns of hoppers are constructed with three and four divisions; one of which may be used to hold the mixed grains; another grit; another broken oyster shells, and the fourth meat scraps. When cut bone is used, the meat scraps would not be necessary. In use in our Division, the hopper system of feeding has been found satisfactory. Where used, the hens have laid equally as well as those fed by other methods. One advantage of the hopper system is that it permits the farmer, who is usually too busy to make a mash every day, to furnish the desirable variety of food.

CHICKENS.

HOW TO FEED AND MANAGE THEM.—METHODS WHICH HAVE BEEN FOUND SUCCESSFUL.

The following methods of caring for and feeding chickens from the time of hatching by natural or by artificial means to marketable age have been practised in our Division with success for many years past.

HEN-HATCHED CHICKENS.

Chickens hatched by natural means should be allowed to remain undisturbed with the hen mother in the nest until thoroughly nest-ripe, when, with their mother they should be removed to a coop, which is placed outside on grass if possible. It is a good plan before removing the chicks to their outside quarters to feed the mother hen generously. It is to be remembered that the hens have been steadily on the nests for 36 hours, hatching out the peeping youngsters and are doubtless very hungry. Having been well fed they are more likely to brood their chickens contentedly than if in a half-starved condition. Attention to these apparent insignificant details has an important bearing on results.

A PROPER RATION FOR CHICKENS.

The following method of feeding and management of the chickens from hatching time until they reach marketable age will, if properly carried out, be found satisfactory.

First day.—The chickens should be well brooded by the hen or carefully kept from being chilled in the brooder. Hardly any food is necessary. If the chicks are hardy and show a desire for food, give stale bread crumbs, but only in small quantity. Experience has shown that newly-hatched chickens require brooding more than anything else during the first day of their existence.

Second day.—Give one part of hard boiled egg, chopped fine, mixed with three parts stale bread crumbs or stale bread soaked in milk and squeezed dry. Feed but little at a time and often.

Third day.—Continue feeding stale bread soaked in milk, but crumbly. Add finely crushed wheat or rice boiled dry, or pin head oatmeal or rolled oats. Continue this treatment for eight or ten days, when finely crushed corn may be given. After twelve or fourteen days give whole wheat.

After twelve or fifteen days, fine cut bone, in small quantity, will be much relished. A mash of shorts, cornmeal, stale bread, &c., may now be given. For drink give water or skimmed milk or both. Grit of chicken size should be placed where the chicks can get at it from the first.

On the hen-hatched chickens becoming fully feathered, their mother hens were removed from them. When well developed, both hen- and incubator-hatched chickens were removed to colony houses. At a later date the cockerels were separated from the pullets. In the case of the Mediteranean breeds it may be necessary to separate the sexes when six weeks of age.

The chickens should be well and regularly fed at the early stage of their existence, at least five times per day, but in small quantities. After five or six weeks of age, three times every day.

Growing chickens require special care during the first five or six weeks of their lives, for during that period there is a steady drain on the system of the chick for rapidly growing feathers as well as for bone, sinew and muscle. This fact is frequently overlooked.

THE BEST TIME FOR FARMERS TO HATCH OUT CHICKENS.

The best time of year for farmers to have their chickens hatch out is the first week of May. Experience has clearly shown this. Unless provided with special facilities, earlier hatched chickens are more likely to be a source of annoyance than of profit. For this reason, the hatching and rearing of early broilers is an enterprise not to be recommended to farmers, as it is not likely to be successful under ordinary farm conditions. Where broiler raising is successfully prosecuted, it is usually in the hands of experts, who use incubator rooms and brooding houses as a means of conducting their operations.

The middle of April has been found the most suitable period for farmers to place the eggs under the hens or to put them into an incubator. For the reason that, by the period mentioned, the hens usually have had an opportunity to run outside and recuperate from their long term of winter life and treatment. As a result of the renewed constitutional vigour likely to be so gained, the germs of the eggs laid by them will probably be strong and eventually hatch out in the shape of robust chickens. Many letters have been received from farmers telling of poor hatching results from early spring eggs. In such cases, the eggs have most likely been laid by hens which have not had a run outside for a sufficiently long period. In too many cases, there is reason to conclude that well-meaning but unavailing effort is bestowed on weakling chickens which, if given to the breeding stock, would be attended with more satisfactory results.

RECAPITULATION OF IMPORTANT POINTS OF INTEREST TO FARMERS WHO DESIRE TO SECURE THE HIGHEST PRICES.

Eggs to secure the best prices should be sold within a week of being laid.

It is of paramount importance that eggs sold during summer should be non-fertilized.

There is reason to believe that, owing to long keeping before being sold, the flavour of fertilized eggs is frequently impaired by germ development in the eggs.

It is said by city wholesale buyers that—in many instances—three or four weeks elapse from the time the egg is laid until it reaches the consumer in the city.

Wholesale city buyers complain of the dirty condition in which a large number of eggs reach them.

For placing of the better quality of poultry, in the very best condition, on the market, it is imperative that the crops of the chickens should be empty of all food previous to killing them. This may be accomplished by giving no food to the birds for twenty-four hours before killing them. Food left in the crop is likely to decompose and ruin the flavour of the carcass no matter how well fleshed it may be. This is an important point well worth remembering.

A QUESTION AS TO HOW TO BREED.

The question may be asked, 'If we have none but non-fertilized eggs from our hens, how then can we breed chickens?' In this way. The farmer should select 7, 9 or 11 of his best marked, best shaped and best laying hens and place them in an enclosure by themselves. Mate them with a vigorous 12 or 15 months' old male bird. Keep them together until sufficient eggs are collected for breeding purposes. The male bird should then be disposed of and the hens kept together for ten days longer, when they may be allowed to run with the other laying stock *with which there has been no male bird.* Unfertilized eggs for sale or for home use may in this way be secured Eighteen months' or two-year-old hens are the best to breed from. It is better to have the birds all of one variety than have them of mixed or nondescript types.

THE FORMATION OF CO-OPERATIVE CIRCLES.

The organization of the Producers' Poultry Association of Eastern Canada marks an important step in advance in the purchasing and selling of eggs and poultry. The aim of the Association is to promote the marketing of strictly new-laid eggs and the better quality of poultry. The consumer is perfectly willing to pay full value for the best quality of eggs and poultry. As it is, in too many cases, he pays the highest price for so-called strictly new-laid eggs to find out, after purchasing them, that they are stale. This the new Association promises to remedy. But its good offices do not end here, for it also guarantees to the producer the highest price, but only for the best articles. In other words the Association aims at bringing the producer, who has the choice articles for sale and the consumer who desires to purchase them, closer together. The following is a brief outline of the work laid out by the promoters of the newly formed Co-operative Association. 'The Association is formed with proper officers to look after the management of affairs. To defray all necessary expenses, every member pays a fee of one dollar per year. Those who join agree to sell only fresh eggs and to market them twice per week during the summer months and once a week during the cold season. The eggs are to be graded according to size and colour. Each case, or at least each tray should have eggs of the same colour and as nearly as possible of the same size. None but fresh eggs are to be marketed; any that are old, rough-shelled, or ill-shaped must not be put in the case.'

In this way, it is hoped that a better price will be paid for eggs that are carefully selected. Branches are being formed throughout the eastern provinces. In the interests of both producers and consumers it is to be hoped that the Association will meet with success.

THE EXPERIMENTAL WORK OF THE YEAR.

LIST OF BREEDING PENS.

At the end of March, 1909, the conclusion of the fiscal year, the following pens of fowls were selected and mated for breeding purposes, namely:—

No. of House.	Pen Number	Breeds.	Males.	Females.	Remarks.
1	1	White Plymouth Rocks..........	1	16	Heated House.
1	2	Buff Orpingtons	1	14	"
1	3	White Leghorns................	1	15	"
1	4	" "	1	16	" Experiment.
1	5	Black Minorcas................	1	12	"
1	6	White Orpingtons.	1	12	"
1	7	Faverolles....................	1	12	"
2	13	Black Hamburghs...............	1	7	"
2	16	White Leghorns................	1	10	" Bad laying strain.
2	17	" "	1	10	" Good " "
2	18	" "	1	5	"
3	25	" "	1	7	"
3	26	" Plymouth Rocks..........	1	10	"
4	32	Buff Orpingtons...............	1	19	Unheated house.
5	33	Barred Plymouth Rocks....	1	23	"
5	34	White Wyandottes..............	1	21	"
6	35	Barred Plymouth Rocks.........	1	20	"
6	36	White Wyandottes..............	1	17	"

EGGS SOLD FOR HATCHING PURPOSES.

As in previous spring seasons, numerous applications were received from many different parts of the country for eggs for hatching purposes. The surplus of eggs over the number required for our natural and artificial hatching experimental work, were sold at one dollar per setting. The eggs were carefully packed in boxes, specially made for the purpose, and sent by express to the different purchasers throughout the country.

Number of settings of eggs thus sold for hatching up to March 31, 1910, 178.

HATCHING CHICKENS BY HENS AND BY INCUBATORS.

Both artificial and natural means were used in hatching chickens. As remarked in a foregoing part of this report, the spring time of last year was peculiarly backward and it was unavoidably late before satisfactory hatching results—by either natural or artificial means—were secured. But the protracted cold weather was not without its lessons. It clearly showed:—

1. That weather conditions in spring time are factors to be reckoned with by farmers in the hatching out of chickens, under ordinary farm conditions.

2. That, should the spring season be cold and late, as it was last year, it would be better to wait for a propitious change in the weather before commencing hatching operations. By so doing, better results are likely to be obtained than if the eggs were set at an earlier but colder period.

3. That chickens of early May hatch are likely to make steadier growth than chickens hatched a month or six weeks earlier in colder weather.

The first eggs to be set were placed under and hatched by hens, at different periods, beginning on April 10 last as shown by the following table:—

TABLE I.—SHOWING NUMBER of Eggs Set and Chickens Hatched by Hens.

Date Eggs were Set.	Description of Eggs.	No. of Eggs. Set.	Broken by hens.	Clear.	With dead germs	Chickens. Dead in the shell	Hatched.	Percentage hatched. From total eggs set.	From fertilized eggs.	Remarks.
1909.										
April 10...	Black Minorcas, Buff Orpingtons, B. P. Rocks, White Wyandottes..........	90	0	32	14	14	30	33⅓	68¼	Eggs were laid by hens which were kept in unheated and in warmed houses.
May 1...	Black Hamburgs, White Orpingtons, White Plymouth Rocks and B. P. Rocks.	98	3	11	15	22	47	48	68	
" 13...	Buff Orpingtons, Barred Plymouth Rocks, White Leghorns, White Wyandottes...	30	2	4	5	5	14	46⅔	73⅔	
	Total	218	5	47	34	41	91	41⅘	69	

All the above hens sat steadily on the eggs given to them and, when the chickens were hatched, made excellent mothers.

HATCHING CHICKENS BY ELECTRICITY.

Hatching chickens by means of heat obtained from the electric wires used for lighting the poultry houses was again successfully accomplished, on two occasions, during the season. The eggs were placed in a small 60-egg incubator from the Cyphers Manufacturing Company, of Buffalo, N.Y., U.S.A., and arranged so as to utilize electricity as a heating medium. The electricity used was, in quantity, enough to supply a 16 candle power house lamp. The machine, which is known as an 'electrobator,' was easy and convenient to operate and kept up the requisite temperature of 103 degrees with remarkable correctness. Results are shown in the following table:—

TABLE 2.—SHOWING NUMBER of Chickens Hatched by Electrobator.

Date when Eggs were placed in Incubator.	Description of Eggs.	No. of Eggs. Set.	Clear.	With dead germs	Chickens. Dead in shell.	Hatched.	Percentage hatched. From total eggs set.	From fertilized eggs.	Remarks.
1909.									
May 1.....	Buff Orpingtons, Barred Plymouth Rocks and White Leghorns	62	16	11	9	26	42	74⅓	Eggs were laid by hens kept in cold houses except those of the White Leghorns.
" 29....	Buff Orpingtons, Barred Plymouth Rocks and White Wyandottes......	64	17	4	7	36	56¼	83¾	

After being hatched, the chickens were placed in a brooder, also heated by electricity, and made satisfactory progress. The apparatus used for heating the brooder is known as an 'electrohover.' The temperatures, in both instances, were kept with great regularity.

HATCHING BY COAL OIL LAMP HEATED INCUBATORS.

A number of eggs were also placed in ordinary incubators with following results:—

TABLE 3.—SHOWING NUMBER of Chickens Hatched by Incubator Heated with Coal Oil.

Date Eggs were placed in Incubator.	Description of Eggs.	No. of Eggs. Set.	Clear.	With dead germs	Chickens. Dead in shell.	Hatched.	Percentage Hatched. From total eggs set.	From fertilized eggs.	Remarks.
1909.									
May 4....	B. Orp., B. P. Rocks, Wh. Wy., Wh. Leg....	110	32	21	18	39	35⅓	68⅓	Eggs were laid by hens kept in both unheated and in warmed houses.
" 11....	" " " " "	96	32	15	9	40	41⅔	81⅔	
" 15....	Wh. P. R., Wh. Wyandottes..	100	34	20	16	30	30	65¼	
June 1....	B. Orp., B.P.R., Wh. Wy., B. M.	107	29	10	19	49	45¾	72	
Total		413	127	66	62	158	38⅕	71¾	

The hens which laid the eggs as described above were unavoidably confined to limited runs and had to be artificially supplied with green food as were the birds mentioned in previous tables 1, 2, and following table 4.

EGGS FROM GOOD LAYERS HATCH STRONG CHICKENS.

The following Table, No. 4, shows the number and the vitality of chickens hatched out of eggs laid by an excellent egg-laying strain of White Leghorn fowls in comparison with other chickens hatched from eggs laid by a poor egg-laying strain of fowls of the same variety and of the same family. The fowls of both strains were kept in the same building—House No. 2—and were fed on the same rations in both cases. It will be noticed that there is a marked difference in the vitality of the chickens, and results are altogether in favour of the better egg-laying strain of birds. The hatching medium was hens in both cases.

TABLE 4.—SHOWING THE NUMBER of Chickens Hatched from Eggs laid by Good and Poor Egg-Laying Strains of White Leghorn Fowls and the great difference in the vitality of the same.

Date Eggs were set.	Description of Eggs. White Leghorns.	No. of Eggs. Set.	Clear.	With dead germs	Chickens. Dead in shell.	Hatched.	Percentage Hatched. From total eggs set.	From fertilized	Remarks.
1909.									
May 20....	Poor laying strain.............	30	9	9	7	5	16⅔	41⅔	Weak from time of hatching.
" 20....	Good laying strain..........	30	3	3	4	20	66⅔	83⅓	Strong and made vigorous growth.

INCUBATOR-HATCHED CHICKS FOR FIRST TEN DAYS REQUIRE GREAT CARE.

The following table is intended to show that incubator-hatched chickens, particularly during the first ten days of their existence, should be protected from risk of chill which is frequently caused by exposure to cold or dampness, irregular temperatures in the brooder, or from being let out too early in the morning on dew-covered grass. Two groups of chickens, marked A and B, after close observation, were chosen as furnishing data calculated to be useful in the early treatment of newly-hatched chickens.

TABLE 5.—SHOWING THE PROGRESS made by Two Groups of Newly-hatched Chickens which were placed in two separate Brooders. The Chicks in the case of Group A. were carefully protected from risk of chill. Group B. Chickens were kept for part of a day, during two weeks, outside of the Brooder and were evidently chilled.

Date when Chickens were put in Brooders.	Groups.	Varieties.	No of Chickens in each Brooder.				Causes of Death.			Remarks.
			First day.	Tenth day.	Twentieth day.	Thirtieth day.	Chalky Diarrhoea.	Weakness.	Accident.	
May 13...	A.	B. Orp., Blk. Min., B. and Wh. P. Rocks ..	58	54	53	52	0	4	2	Strong and made rapid growth.
" 20...	B.	Wh. Leg. and Wh. Wyandottes..........	52	20	18	15	33	4	0	Made slow growth and many died from white or chalky diarrhoea. Presumably chilled.

WARMED vs. UNHEATED HOUSES.

EGG-LAYING RESULTS FROM GROUPS OF FOWLS KEPT IN WARMED AND IN UNHEATED HOUSES.

The following four tables give results in egg laying by different groups of fowls placed in artificially warmed and also in unheated houses, during the past year. This interesting line of experimental work was commenced a few years ago and the data so far obtained are much in favour of the unheated houses. Particularly valuable is the experience gained from the favourable effects of the unheated, or cotton front style of fresh-air house on the production of eggs and the general health of the fowls, during the winter season. The introduction of the unheated house principle in all its different adaptations of colony, or cotton front or other patterns, may be said to have revolutionized the methods of poultry keeping which for so many years have been in vogue. The following tables, 6, 7 and 8, show egg-laying results from fowls kept in artificially-warmed houses.

TABLE 6.—SHOWS THE NUMBER of Eggs laid by 13 White Plymouth Rock Hens, for Twelve Months. The Birds were kept in Pen No. 1 of No. 1 Poultry House, which was artificially warmed by means of a stove. The Fowls were in their second year.

Thirteen White Plymouth Rock Hens. — 2 years old.	1908.		1909.										Total number of eggs laid during the year.	Remarks
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		The pen in which these fowls were kept was in a building artificially heated.
Eggs laid per month	0	35	115	67	107	176	187	81	38	20	18	3	847	Average 65 eggs each.

TABLE 7.—SHOWING NUMBER of Eggs laid by 4 Hens and 8 Pullets of Buff Orpingtons. Fowls were kept in Pen No. 2 of No. 1 House, which was artificially warmed.

Buff Orpingtons. 4 hens and 8 pullets—12.	1908.		1909.										Total of eggs laid during the year.	REMARKS.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		Best hen laid 79 eggs. Poorest hen laid 12 eggs.
Eggs laid per month......	3	44	61	56	82	110	49	60	26	0	7	0	498	Average 41½ each.

RATIONS FED TO ABOVE HENS.

Morning and Evening.—Whole grain: ½ wheat, ½ oats. Thrown in the litter on floor of house.

Noon.—Ground grain fed dry: 1 part corn, 1 part barley, 1 part oats, 1 part wheat bran.

2. Every third day: Ground raw bone. After April 20 replaced by meat scrap, one part of which was mixed in the dry feed.

3. Every third day (in winter) raw vegetables. There was a constant supply of gravel and oyster shells.

TABLE 8.—SHOWING THE EGG RECORD of 11 White Leghorn Pullets hatched on the 20th of May, 1908, for twelve months. The Birds were kept in Pen No. 3 of No. 1 house, which was artificially warmed.

11 White Leghorn Pullets.	1908.		1909.										Total of eggs laid during the year.	REMARKS.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		Hatched out May 20.
Eggs laid per month......	2	84	96	53	130	172	131	34	9	0	11	0	722	Average 65½ each.

EGG-LAYING IN UNHEATED HOUSES.

TABLE 9.—THE GROUP of fowls in this case was composed of 11 hens and 5 pullets of the Buff Orpington variety. These birds were kept in an unheated house with a cotton front which is, at present, one of the most popular patterns of a modern poultry house.

Buff Orpingtons. 11 hens. 5 pullets.	1908. November.	December.	1909. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of eggs laid during the year.	Remarks. Best hen laid 140 eggs. Poorest " 45 "
Eggs laid per month......	14	69	82	189	189	152	177	127	72	59	69	11	1,208	Average 75½ each.

The above fowls were of the same age and were fed the same rations as were the inmates of Pen No. 2 of No. 1 house. The composition of the ration is shown in the preceding table No. 7, with which the results in this case should be compared. The striking difference will be noted that the best layer in this unheated house gave a yield of 140 eggs in the year, as compared with 79 of the best layer in a warmed house as shown in table No. 7.

The following table will be read with interest as showing the average number of eggs laid by fowls of different varieties, which were kept in houses of different patterns but all unheated.

TABLE 10.—RECORDS THE NUMBER of eggs laid by the fowls of the different varieties which are described in the following table, from November 1, 1908, to October 31, 1909. The birds were all inmates of 'unheated houses.'

Breeds.	Hens or Pullets.	Description of house.	Total of eggs laid in 12 months.	Average of eggs laid.	Remarks.
10 Barred Plymouth Rocks..	Hens.....	Cold.......	830	83	The birds during the winter season were in excellent health.
16 White Wyandottes.......	"	"	1,193	74¼	
14 Barred Plymouth Rocks..	Pullets. ..	"	1,245	89	
13 White Wyandottes......	" ...	"	1,016	78	

Rations fed were the same as described in table No. 7.

Some of the hens of each of the above varieties were used as sitters and mothers to hatch and rear chickens during the summer season.

SELECTION OF GOOD EGG LAYERS.

PERCENTAGES OF IMPROVEMENT IN EGG LAYING, SECURED BY TRAP-NEST SELECTION.

The work of selecting and breeding from good egg-laying strains of fowls is most interesting and important. The following table shows the percentages of improvement made, in certain breeds of fowls, in four years by means of selection by trap-nests of the best layers and by breeding from them. The work of selecting the good

from the poor egg layers, by means of trap nests, commenced in the year 1905 and is still going on. As remarked in a previous report, the work of developing prolific egg-laying strains of fowls is unavoidably slow and is rendered still more difficult where a large number of fowls are kept. A busy farmer is not likely to have time to attend to any more than a limited number of hens by the trap-nest method and it is doubtful if it will ever become popular with him. Although mechanically correct in securing results, it is a system demanding unflagging attention, for at least the fore part of the day and entailing the keeping of correct records of both male and female lineage. On several occasions during the work of selection, male birds were purchased from outside sources. These birds had no guaranteed pedigree and there is reason to conclude that their use retarded rather than forwarded the work of breeding prolific egg-layers. It is most important that the male birds used as breeders should come from a prolific egg-laying strain of females.

TABLE 11.—SHOWING THE PERCENTAGE RESULTS of four years' breeding from fowls of excellent egg-laying record as proved by the use of trap-nests. The record of both hens and pullets are given. The birds were kept in artificially warmed and in unheated houses.

Breeds.		1905.		1906-07.		1907-08.		1908-09.		1909-10.	
		Kept in a heated house.	Kept in a cold house.	Heated house.	Cold house.	Heated house.	Cold house.	Heated house.	Cold house.	Heated house.	Cold house.
Barred Plymouth Rocks.	Hens	62½	......	......	76	65	70	61⅓	83	......	83
	Pullets	......	63½	65¾	58	50½	68½	......	69½	......	89
White Plymouth Rocks.	Hens	......	......	......	......	54	......	......	......	65	......
	Pullets	......	......	50½	......	......	......	71½	......	......	......
White Leghorns	Hens	44	......	75	......	53	......	71	......	......	......
	Pullets	80½	......	77½	......	65	......	66	......	65½	......
White Wyandottes	Hens	57⅓	......	......	74½	......	104	......	97	......	71½
	Pullets	......	62¾	......	60¼	......	74¾	......	80	......	[illegible]
Buff Orpingtons	Hens	64	......	56⅔	......	50	......	62⅓	......	41½	75½
	Pullets	62½	......	58	......	52½	......	......	93	......	......

MINOR DETAILS OF THE YEAR'S WORK.

During the fall and winter seasons the following birds were disposed of for breeding and eating purposes, namely:—

Males for breeding.......... 44
Females for breeding.......... 52
Culls or mixed breed males sold for table use.......... 41
Culls or mixed breed females sold for table use.......... 28
Number of eggs sold for eating purposes.......... 584 do
Number of eggs sold for hatching purposes up to March 31, 1910. 178 settings.

WHEN THE PULLETS COMMENCED TO LAY.

The pullets of the different varieties began to lay in the following order and at the dates specified, namely:—

White Leghorn pullet commenced to lay December 1, 1909.
Buff Orpington pullet commenced to lay December 4, 1909.
Black Minorca pullet commenced to lay December 3, 1909.
B. Plymouth Rock pullet commenced to lay December 13, 1909.
White Wyandotte pullet commenced to lay December 15, 1909.

NUMBER OF EGGS LAID DURING THE YEAR.

The following is a list of the number of eggs laid during the different months of the year, dating from April 1, 1909, to March 31, 1910:—

1909.—	April	2,623
	May	2,573
	June	1,187
	July	575
	August	309
	September	124
	October	47
	November	189
	December	611
1910.—	January	888
	February	996
	March	2,651
	Total	12,773

ACKNOWLEDGMENT

I have to acknowledge the kindness of Dr. Higgins, Pathologist of the Veterinary Laboratory, Experimental Farm, in making *post mortem* examinations of young and old birds which died during the year. His determinations as to cause of death (which was, as a rule, due to disorders of the stomach and intestines) were of service to our Division in regulating the quantities of food to be given at different seasons of the year.

STOCK ON HAND ON MARCH 31, 1910.

Pen No.	Breeds.	Cocks.	Hens.	Cockerels.	Pullets.	Total.	Remarks.
1	White Plymouth Rocks	......	14	1	......	15	
2	" "	......	......	1	13	14	
3	White Leghorns	1	28	....	......	29	Good egg laying strain.
5	" "	1	......	......	14	15	" "
7	Faverolles	......	8	.....	......	8	
16	White Leghorns	1	6	......	3	10	Poor egg laying strain.
18	Barred Plymouth Rocks	......	......	1	5	6	Special laying strain.
20	Buff Orpingtons	1	......	....	7	8	
26	Black Minorcas	1	10	......	5	16	
32	Buff Orpingtons	1	22	....	......	23	In cotton front house.
33	White Wyandottes	......	21	1	......	22	In cold house.
34	Barred Plymouth Rocks	......	29	1	......	30	"
35	" "	1	......	......	28	29	"
36	White Wyandottes	1	......	......	20	21	"
	For breeding and eating purposes	16	13	......	24	53	In different pens.
	Capons	......	.....	2	......	2	
	Totals	24	151	7	119	301	

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., March 31, 1910.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-second annual report of the operations on the Experimental Farm for the maritime provinces, at Nappan, N.S., for the year ending March 31, 1910.

The summer season of 1909 was one of the most favourable for the growing of farm crops experienced here for some time.

Following a backward spring, seeding began unusually late, the weather being cold and wet until May 23. After this, no rain fell here until June 28. The first seeding was done on May 25, but, on account of the steady dry and cool weather throughout, the last was sown quite as early as usual, on June 23. From this out, the season was one of the very best seen here for some years. Alternate dry and wet spells came at about the right times until the beginning of September, when rainy weather set in, and continued with short intervals of a few days at a time, making it extremely hard to proceed with the gathering of the crops and with other fall work.

Grain crops ripened rather rapidly. The yields are barely up to the average, but roots (particularly turnips) were unusually good. Corn was but little above the usual crop. Hay and grass were both better than usual. The apple crop was not nearly as good as in past years.

I again desire to acknowledge the services of Mr. Thomas Coates, farm foreman, and of Mr. Robert Donaldson, herdsman, who have so ably assisted me in their respective departments, practically all the records having been kept by them.

EXPERIMENTS WITH SPRING WHEAT.

Fourteen varieties of spring wheat were sown in uniform test plots of one-fortieth acre each. The land was a clay loam on which ensilage corn had been grown the previous year (1908), for which crop, barnyard manure at the rate of 20 tons per acre had been applied. No manure or other fertilizer was used for this crop.

The land was ploughed in the fall of 1908, and well worked up in the spring (1909) and sown May 25, with seed selected from picked heads of the previous year's crop, sown at the rate of 1¾ bushels per acre, together with Common Red clover, 7 lbs., Alsike clover, 3 lbs., and timothy seed, 12 lbs., per acre.

Cold, dry weather for at least one month subsequently to the sowing caused rather poor growth at the first, while weeds got more than a usual start over the crop.

There was a little rust on the following varieties: Hungarian White, Marquis, Huron, Bobs and Stanley, the last (Stanley) being affected quite badly.

The following were the yields obtained:—

SPRING WHEAT.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Pringle's Champlain....	Sept.	7	99	44 to 48	Stiff......	2⅓ to 3	Bearded ..	3,080	34	..	56½
2	Bishop..................	"	7	99	42 " 46	"	2½ " 3	Beardless...	2,880	34	..	56¾
3	Bobs..................	"	1	93	36 " 40	"	2⅓ " 3	" ...	2,920	31	20	58
4	Chelsea..................	"	1	93	35 " 38	"	2½ " 3	" ...	2,840	30	..	58¼
5	Huron..................	"	7	99	36 " 40	"	2 " 3	Bearded. ...	3,160	29	20	58¼
6	Hungarian White......	"	3	95	36 " 40	"	2½ " 3	" ...	2,720	28	40	59
7	Red Fife..............	"	11	103	43 " 46	"	2 " 3	Beardless..	3,240	28	..	56
8	White Fife.	"	11	103	40 " 42	"	3 " 3½	" ...	3,040	26	40	58
9	Preston..............	"	5	97	36 " 40	"	2½ " 3	Bearded....	2,640	24	40	57½
10	Percy..................	"	7	99	40 " 44	"	2⅓ " 3	Beardless...	3,120	24	20	55
11	Marquis..............	"	7	99	40 " 44	"	2 " 3	" ...	2,680	24	..	58
12	White Russian......	"	11	103	37 " 42	"	2 " 3	" ...	2,880	23	20	57¾
13	Riga..................	"	5	97	38 " 40	"	2 " 3	" ...	2, 60	21	20	58½
14	Stanley....	"	7	99	38 " 42	"	2½ " 3¼	" ...	2,960	20	40	57

EXPERIMENTS WITH DURUM OR MACARONI WHEAT.

Four varieties of Durum or Macaroni wheat were grown in uniform test plots of one-fortieth acre each.

The land was similar to, and received the same treatment as, the spring wheat plots, and was sown May 26.

The following were the yields obtained:—

MACARONI OR DURUM WHEAT.—Test of Varieties.

Number	Name of Variety.	Date of Ripening.		No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Roumanian............	Sept.	13	105	34 to 38	Stiff	2 to 2½	Bearded....	2,920	25	20	57½
2	Goose..............	"	7	99	32 " 36	"	1½ " 2¼	" ...	2,440	24	..	58
3	Mahmoudi	"	7	99	32 " 36	"	1⅓ " 2	" ...	2,480	20	..	54¾
4	Yellow Gharnovka.....	"	13	105	30 " 35	"	2 " 2½	" ...	2,400	18	..	60½

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties each of Emmer and Spelt were sown May 26 in plots of one-fortieth acre each.

The land was similar to that on which the other spring wheats were sown, and received the same treatment.

The yields from these plots are given in pounds, as, with the ordinary threshing, the chaff is not separated from the kernels and the result cannot well be compared with the other sorts of wheat which are threshed clean.

The following were the yields obtained:—

EMMER AND SPELT.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Yield per Acre.
				Inches.		Inches.		Lbs.
1	White Spelt	Sept. 13	111	36 to 40	Stiff	3 to 4	Beardless	1,600
2	Common Emmer	" 1	99	30 " 33	"	1½ " 2	Bearded	1,480
3	Red Spelt	" 13	111	33 " 38	"	3 " 4	Beardless	1,400
4	Red Emmer	" 13	111	36 " 40	"	2 " 2½	Bearded	1,360

EXPERIMENTS WITH OATS.

As in other years, experiments were conducted with the leading varieties of oats, which were grown in uniform test plots of one-fortieth acre each. Twenty varieties were included in this test. The plots all received the same treatment as to cultivation and were on soil fairly uniform throughout.

The ground was a heavy clay loam, on which ensilage corn had been grown the previous year (1908) for which crop, barnyard manure at the rate of 20 tons per acre had been used. The land was ploughed in the fall (1908) and harrowed in the spring (1909) with the spring-tooth and smoothing harrows until a fine tilth was made. The seed was then sown at the rate of 2½ bushels per acre. Clover and Timothy was also sown at the rate of, Common Red clover, 7 lbs., Alsike clover, 3 lbs., and Timothy seed 2 lbs. per acre, by means of a grass seed attachment to the grain seeder. The seed oats used were from selected heads of the previous season's crop, cut from the various plots at harvest time, and sown May 25. No fertilizer of any kind was used on these plots. The grain started slowly on account of the unusually cold and dry weather, which continued for about one month after the sowing of the crop, the result being somewhat lower yield than usual.

There was considerable rust in all cases, but no variety specially affected, with very little smut.

The following yields were obtained:—

OATS.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Banner	Sept.	3	101	36 to 40	Stiff	6 to 8	Branching	4,040	56	16	34
2	White Giant	"	1	99	36 " 40	"	6 " 7	"	3,680	52	32	34
3	Virginia White	"	1	99	33 " 36	"	5 " 6	"	3,720	51	26	32
4	Abundance	"	3	101	36 " 40	"	6 " 8	"	3,880	50	..	34¼
5	Milford White	"	3	101	40 " 44	"	7 " 8	Sided	3,920	49	14	37
6	Danish Island	"	1	99	33 " 38	"	5 " 7	Branching	3,760	49	14	34
7	Kendal White	"	3	101	37 " 40	"	6 " 8	"	3,800	48	08	33
8	American Triumph	"	13	111	44 " 48	"	7 " 8	"	3,760	48	08	35
9	Lincoln	"	3	101	35 " 38	"	5 " 7	"	3,720	47	22	33
10	Irish Victor	"	3	101	34 " 38	"	6 " 8	"	3,440	47	22	34½
11	Golden Beauty	"	1	99	35 " 40	"	5 " 7	"	3,800	47	02	34
12	Siberian	"	3	101	33 " 42	"	7 " 9	"	3,680	47	02	36½
13	Wide Awake	"	1	99	38 " 42	"	6 " 8	"	3,520	46	16	33
14	Twentieth Century	"	1	99	36 " 40	"	6 " 8	"	3,520	45	30	33
15	Thousand Dollar	"	1	99	35 " 38	"	6 " 8	"	3,640	45	30	33
16	Swedish Select	"	3	101	34 " 36	"	7 " 8	"	3,480	44	24	32
17	Improved American	"	11	109	40 " 43	"	6 " 8	"	3,520	42	32	35¼
18	Improved Ligowo	"	1	99	36 " 40	"	6 " 7	"	3,440	42	12	30¼
19	Pioneer	Aug.	31	98	36 " 38	"	6 " 8	"	3,440	41	26	34¼
20	Storm King	Sept.	1	99	40 " 44	"	6 " 9	Sided	3,520	41	06	38¾

FIELD CROP OF OATS.

Three acres of oats were grown in one lot. The field was a clay loam in rather a good state of fertility, having grown hay the previous year, for which crop a dressing of barn-yard manure, at the rate of 20 tons per acre had been used as a top dressing, spread on in winter.

On account of the continued cold, dry weather after sowing, this crop made rather a slow start, while weeds got more than a usual advantage over the crop.

By July 1, some rust was noticed, which continued to increase until the whole crop was badly affected. It yielded 84 bushels, being at the rate of 28 bushels per acre.

The seed was sown May 27, and cut September 8.

FIELD CROP OF OATS ON MARSH.

Seven acres of oats were grown on ordinary marsh or dyke land, on which timothy hay had been grown for a term of years previously. This land was ploughed in the fall of 1908 and sown June 3, 1909.

This crop made only a fairly good growth, and was cut from September 16 to 25, but, owing to the extremely wet weather, was not at the time got in. While the oats were cut, but still in the field, a very exceptionally high tide arose, claimed to be the highest since the famous Saxby tide 40 years ago, breaking much of the dykes, flooding the marshes, and destroying very much of this crop, which was eventually got in in an almost ruined condition, and from which 131 bushels was obtained, no record being possible of the yield of individual acres.

EXPERIMENTS WITH BARLEY.

Experiments were conducted in uniform test plots with twenty varieties of barley (ten of six-rowed and ten of two-rowed) in plots of one-fortieth acre each.

The land was a heavy clay loam on which ensilage corn had been grown the previous year (1908), for which crop barn-yard manure at the rate of 20 tons per acre had been used.

No manure or other fertilizer was used for this crop.

The land was ploughed in the fall of 1908 and thoroughly worked up in the spring with spring-tooth and disc harrows, and sown May 26, at the rate of 2 bushels per acre, together with 7 lbs. Common Red clover, 3 lbs. Alsike clover, and 12 lbs. Timothy seed per acre.

The seed used was from selected heads of the previous year's crop.

There was more or less smut but no rust.

The following were the yields obtained:—

SIX-ROWED BARLEY.—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Stella	Aug. 30.	96	36 to 40	Stiff	2 to $2\frac{3}{4}$	3,320	55	..	47
2	Mensury	" 26.	92	34 " 38	Medium	$2\frac{1}{2}$ " 3	3,240	51	32	$44\frac{3}{4}$
3	Odessa	" 23.	89	35 " 38	"	2 " $2\frac{1}{2}$	2,880	48	12	$46\frac{1}{2}$
4	Yale	" 30.	96	35 " 40	"	$2\frac{1}{4}$ " 3	3,160	48	04	$45\frac{1}{2}$
5	Trooper	" 24.	90	33 " 36	"	2 " $2\frac{1}{2}$	3,120	47	24	$45\frac{1}{2}$
6	Nugent	" 24.	90	36 " 40	Stiff	2 " $2\frac{3}{4}$	3,040	46	32	$46\frac{3}{4}$
7	Oderbruch	" 23.	89	36 " 40	Medium	2 " $2\frac{1}{2}$	2,840	46	12	46
8	Albert	" 25.	91	34 " 38	Stiff	2 " $2\frac{1}{2}$	2,920	45	40	48
9	Mansfield	" 26.	92	36 " 40	"	$2\frac{1}{3}$ " 3	2,960	43	16	$46\frac{1}{2}$
10	Claude	" 25.	91	36 " 40	"	2 " $2\frac{1}{2}$	2,720	40	40	$47\frac{1}{2}$

TWO-ROWED BARLEY.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Swedish Chevalier	Aug. 31.	97	34 to 38	Weak	3 to 4	2,960	58	16	46
2	French Chevalier	" 31.	97	36 " 38	Medium	3 " 4	3,080	55	00	47
3	Danish Chevalier	" 31.	97	36 " 40	"	3 " $3\frac{1}{2}$	2,840	49	08	47
4	Canadian Thorpe	" 30.	96	38 " 41	Stiff	$2\frac{1}{2}$ " 3	2,720	47	24	46
5	Beaver	" 30.	96	37 " 40	Medium	3 " 4	2,680	45	40	47
6	Invincible	" 30.	96	40 " 44	Stiff	3 " $3\frac{1}{2}$	2,880	41	12	48
7	Gordon	" 30.	96	38 " 42	"	$2\frac{1}{2}$ " 3	2,760	40	40	$46\frac{1}{3}$
8	Clifford	" 30.	96	38 " 42	"	$2\frac{1}{2}$ " $3\frac{1}{4}$	2,800	40	00	$47\frac{1}{2}$
9	Standwell	" 30.	96	38 " 42	"	$2\frac{1}{3}$ " 3	2,640	39	08	44
10	Jarvis	" 30.	96	36 " 41	"	$2\frac{1}{2}$ " 3	2,520	30	40	$49\frac{3}{4}$

FIELD CROP OF BARLEY.

One acre of Odessa barley was grown on a heavy clay loam, the previous crop having been mangels, for which crop barn-yard manure at the rate of 20 tons per acre had been used.

This, like all the rest of the early sown grain, owing to the continued cold and wet weather, made rather a poor start, while weeds got rather an unusual advantage over the crop.

The seed was sown May 28, and yielded 23 bushels.

EXPERIMENTS WITH PEAS.

Sixteen varieties of peas were sown, in uniform test plots of one-fortieth acre each, on a clay loam soil (largely clay), on which turnips had been grown the previous year (1908), for which crop barn-yard manure at the rate of about 20 cart loads per acre had been used. The land was ploughed in the fall, well worked up in the spring and sown June 5 with the seed drill, at the rate of from 2 to 3 bushels per acre, according to the size of the pea. At the same time, it was seeded with Common Red clover, 7 lbs., Alsike clover, 3 lbs., and Timothy seed 12 lbs. per acre.

This crop, although starting slowly, made quite satisfactory growth.

The following yields were obtained:—

PEAS.—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				Inches.		Bush.	Lbs.	Lbs.
1	Large White Marrowfat	Sept. 16	103	2 to 3	Large	26	..	63
2	Daniel O'Rourke	" 13	100	2 " 2½	Small	23	20	63
3	Mackay	" 17	104	2 " 3	Large	21	20	63½
4	Paragon	" 17	104	2 " 2½	Medium	20	..	63¾
5	Picton	" 16	103	2 " 3	"	19	20	63
6	Prince	" 16	103	2 " 3	"	19	..	62½
7	Prussian Blue	" 14	101	1½ " 2	Small	18	40	64
8	Black-Eye Marrowfat	" 17	104	2 " 2½	Medium	18	..	62½
9	Early Britain	" 15	102	2 " 2½	"	17	20	61
10	Arthur	" 15	102	2 " 2½	"	16	40	63½
11	Wisconsin Blue	" 15	102	2 " 2½	"	16	..	63
12	Chancellor	" 13	100	1½ " 2	Small	15	20	64
13	Golden Vine	" 13	100	1½ " 2	"	14	40	62¼
14	Gregory	" 15	102	2 " 2½	Medium	14	..	63
15	English Grey	" 15	102	2 " 2½	"	13	20	58½
16	Victoria	" 18	105	2 " 2½	"	11	20	62

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown in uniform test plots of one-fortieth acre each. The ground was a heavy clay loam on which ensilage corn had been grown the previous year (1908), for which crop barn-yard manure at the rate of 20 tons per acre had been used.

The seed was sown June 5 and cut September 3.

No manure or fertilizer was used for this crop.

The following yields were obtained:—

BUCKWHEAT.—Test of Varieties.

Number.	Name of Variety.	No. of days maturing.	Average length of Straw including Head.	Yield per Acre.		Weight per measured Bushel after Cleaning.
			Inches.	Bush.	Lbs.	Lbs.
1	Tartarian	90	34 to 38	40	40	50
3	Silver hull	90	36 " 40	40	20	51
3	Japanese	90	36 " 40	40	..	48
4	Grey	90	34 " 38	39	08	50
5	Rye-Buckwheat	90	36 " 40	38	16	50

FIELD CROPS OF BUCKWHEAT.

Eight acres of buckwheat were grown, seven acres of which was Silverhull, and one acre Grey.

The land was a sandy loam in rather a poor state of fertility, the previous crop having been hay.

The seed was sown June 17 and yielded:—Silverhull, 25 bushels 20 lbs. per acre; Grey, 25 bushels per acre; a total of 202 bushels, 20 lbs.

EXPERIMENTS WITH INDIAN CORN.

Thirteen varieties of Indian corn for ensilage were sown in uniform test plots. The land was a sandy loam on which timothy hay had been grown the previous season. Barn-yard manure at the rate of 20 tons per acre was spread on the surface in the late fall and early winter of 1908, and left until a good growth of grass had started the following spring. This was then ploughed from 4 to 6 inches deep, and cultivated well on the surface, but not deeply.

Each variety of Indian corn was sown in rows 36 inches apart, and also in hills 36 inches apart each way. This was gone over with the smoothing harrow just before the plants came through the ground, and cultivated between the rows with a one-horse cultivator about once each week until the corn was from three to four feet high. The plants in the rows were thinned out to from 4 to 6 inches apart, and those in the hills to from 3 to 6 plants in a hill. The yield of each variety from both rows and hills was calculated and the weight of crop gotten from 2 rows each 66 feet long. The corn was sown June 10 and cut October 6.

The following were the results obtained:—

INDIAN CORN.—Test of Varieties.

No. of Plot.	Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Condition when Cut.	Weight per acre grown in Rows, Tons.	Lbs.	Weight per acre grown Hills. Tons.	Lbs.
		In.								
1	Angel of Midnight .. .	82	Leafy	Sept. 16	Sept. 1	Soft glazed..	22	.....	19	1,050
2	Compton's Early........	80	Very leafy..	Aug. 13	" 1	" ..	20	1,250	17	100
3	Selected Leaming. ...	84	Fairly leafy.	" 20	" 6	Early milk..	20	1,250	16	1,990
4	White Cap Yellow Dent.	86	" ..	" 20	" 6	" ..	20	700	15	1,680
5	Longfellow.	80	Very leafy..	" 12	" 1	Soft glazed..	19	1,600	18	1,950
6	Eureka.................	90	Med. leafy..	" 31	....	Silking.	18	1,500	15	580
7	Champion White Pearl..	90	Fairly leafy.	Sept. 6	....	"	18	1,070	14	930
8	Wood's Northern Dent..	87	Very leafy..	" 6	Sept. 20	Late milk...	18	850	20	1,800
9	Salzer's All Gold........	88	Fairly leafy.	Aug. 12	" 21	Silking.	17	1,970	15	1,570
10	Superior Fodder........	81	" ..	Sept. 6	" 21	"	15	1,900	15	1,350
11	Mammoth Cuban........	83	" ..	" 6	" 21	Watery.....	15	1,570	13	950
12	North Dakota White....	76	Very leafy..	Aug. 20	" 6	Soft glazed.	14	1,150	16	450
13	Early Mastodon.........	78	Fairly leafy.	Sept. 1	" 15	Watery.....	14	600	14	50
14	Davidson...............	64	" ..	Aug. 12	" 1	Late milk...	14	270	12	200

INDIAN CORN SOWN AT DIFFERENT DISTANCES APART.

In this experiment, the soil and its treatment were identical with the previous test. Three varieties were used, each plot being 2 drills, each 66 feet long.

It was sown June 10, and cut October 6, with the following results:—

INDIAN CORN.—Sown at different distances apart.

Name of Variety.	Distances Apart.	Yield per Acre. Tons.	Lbs.
	Inches.	Tons.	Lbs.
Longfellow..........	42	16	700
"	35	17	400
"	28	16	1,200
"	21	14	1,400
Champion White Pearl..........	42	16	60
" "	35	21	1,680
" "	28	19	00
" "	21	18	1,800
Selected Leaming..........	42	17	1,980
"	35	20	00
"	28	21	900
"	21	19	380

FIELD CROP OF INDIAN CORN.

One and one-half acres of Indian corn was grown in half-acre lots, the varieties used being Longfellow, Dakota White and Selected Leaming. The land was a sandy loam on which timothy hay had been grown the previous year. It was manured in the fall of 1908 with barnyard manure at the rate of 20 tons per acre, left in grass until just before sowing time, the grass ploughed down, cultivated well on the surface and sown June 11 in rows 36 inches apart. The surface was harrowed before the plants came up, and cultivated between the rows four times. The plants were thinned out with the hoe to from 4 to 6 inches apart in the rows and cut October 6 to 8.

The yields were: 'Longfellow,' 15 tons, 1,425 lbs. per acre. 'Dakota White,' 13 tons, 875 lbs. per acre. 'Selected Leaming,' 17 tons, 1,200 lbs. per acre.

FIELD CROPS OF OATS, BARLEY AND MIXED GRAIN.

Five acres of field grain, in lots of one acre each, were sown May 26.

The land was a clay loam and had been in clover hay the previous year. This field had not received any manure or other fertilizer since 1904, in which season roots were grown. Since that, alternate crops of grain and clover hay were grown.

Clover and timothy seed, at the usual rate of 10 lbs. Clover and 12 lbs. timothy per acre, were sown.

The oats in this field were considerably rusted.

The results obtained are as follows, allowing 40 lbs. per bushel for mixed grain, 48 lbs. per bushel for barley, and 34 lbs. per bushel for oats:—

Crops.	Yield per Acre.		Weight per Bush.
	Bush.	Lbs.	Lbs.
1 Acre Odessa Barley	35	..	48
1 " Sensation Oats	23	..	34
1 " Waverley "	29	17	34
1 " Pioneer "	32	24	34
1 " Mixed grain	35	20	40

FIELD CROPS OF MIXED GRAIN.

OATS, BARLEY AND PEAS.

Five acres of mixed grain were sown. The land was a clay loam in a fairly good state of fertility, the previous crop having been clover hay and a heavy crop of aftermath turned under in the fall.

This field was sown May 27 with a mixture of Waverley oats 2 bushels, Odessa barley 1 bushel, and Golden Vine peas ½ bushel, sown at the rate of 3 bushels per acre.

The grain was cut September 4, and yielded 34 bushels, 32 lbs. per acre, at 40 lbs. per bushel.

There was considerable rust on the oats of this crop.

FIELD CROPS OF MIXED GRAIN AND BLACK OATS.

Four acres of mixed grain, and one acre of Black Tartarian oats were grown in one field. This was a light sandy loam on which turnips had been grown the previous year, and for which crop, manure, at the rate of 20 tons per acre, had been applied.

This was sown June 7, and cut September 13.

The mixed grain yielded 35 bushels, 25 lbs. per acre, and the oats 48 bushels per acre.

FIELD CROPS OF OATS, BARLEY AND PEAS MIXED.

Two acres of mixed grain were grown. The land was a clay loam, largely in a poor state of fertility, having been used for a series of plots for fertilizer experiments from 1899 to 1903, during which period some plots had commercial fertilizers, some barn-yard manure, and some were left unfertilized. The following five years, 1904 to 1908, this field was cropped continuously with grain without any fertilizer of any kind being applied.

No fertilizer was used this season, 1909.

The yield from this field was 44 bushels.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown in uniform test plots on June 4, and a duplicate set on June 18. The land was a clay loam on which timothy hay had been grown the previous year. This was ploughed in the fall of 1908, well cultivated in the spring, and barn-yard manure spread on the surface at the rate of 20 tons per acre, which was ploughed under with a gang plough, and the land again thoroughly cultivated. Complete fertilizer (made up in the proportion of superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.), mixed together, and sown at the rate of 300 lbs. per acre, was then spread on the surface and harrowed in with the smoothing harrow.

The seed was sown in rows 24 inches apart, and the plants thinned out to one foot apart in the row. The crop was cultivated between the rows with a one-horse cultivator, on an average every ten days up to about July 15, and gone through with the hoe once besides thinning. The yield was calculated from the weight gathered from two rows, each 66 feet long.

This crop was pulled November 2, with the following results:—

No. of Plot.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
1	Magnum Bonum	39	1,200	1,320	..	26	1,295	888	15
2	Kangaroo	36	105	1,201	45	28	1,255	954	15
3	Carter's Elephant	35	1,280	1,188	..	27	780	913	..
4	Halewood's Bronze Top	35	950	1,182	30	25	655	844	15
5	Hall's Westbury	35	125	1,168	45	25	1,150	852	30
6	Jumbo	34	475	1,141	15	29	1,895	998	15
7	Mammoth Clyde	32	350	1,072	30	30	225	1,003	45
8	Hartley's Bronze	31	1,525	1,058	45	28	1,420	957	..
9	Good Luck	31	1,030	1,050	30	28	595	943	15
10	Bangholm Selected	30	1,875	1,031	15	31	700	1,045	..
11	Skirving's	30	225	1,003	45	23	1,025	783	45
12	Perfection Swede	28	925	948	45	28	100	935	..

FIELD CROP OF TURNIPS.

Eight acres of turnips were grown in lots of one acre each. The land varied from a clay to a light sandy loam, some of each being included in each plot. The previous crop had been hay. The land was ploughed in the fall of 1908, well worked up in the spring, and barn-yard manure at the rate of 20 tons per acre spread on the surface and ploughed under lightly with the gang plough. It was again thoroughly cultivated, and the rows run up 24 inches apart, as far as possible from 24 to 48 hours ahead of seeding time. To one-half of one acre was added complete fertilizer (superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.), at the rate of 600 lbs. per acre, and to the other half at the rate of 300 lbs. per acre, and to one-half of each of the other seven acres at the rate of 300 lbs per acre; the other half of each of the seven acres receiving the barn-yard manure only.

The weather was cold and dry for a long time after sowing, with the result that the seed started very poorly, not more than possibly one-tenth of the seed germinated, and it looked very much as if all would have to be resown. A good fall of rain was experienced on the night of June 28. Shortly after this, on examining closely, it could be seen that the remainder of the seed was beginning to germinate. It came

up nicely in about 4 or 5 days, being all of 3 weeks after sowing. From this on, the crop made very satisfactory growth.

Sown June 12 to 17 and harvested November 6 to 18, with the following results:—

FIELD CROP OF TURNIPS.

Name of Variety, How Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Hartley's Bronze Top—(Pulled November 6).					
½ acre. Manure and fertilizer, 600 lbs. per acre..........		28	1,970	966	10
" " " 300 "		27	1,890	931	30
Cost per acre of extra fertilizer, 300 lbs. at $32 per ton...	$ 4 80				
Value per acre of increased crop from extra fertilizer, 34⅘ bush. at 6c. per bushel..........	2 08				
Loss per acre..........	$ 2 72				
Kangaroo—(Pulled November 8).					
½ acre. Manure and fertilizer, 300 lbs. per acre..........		27	900	915	..
" " only..........		24	1,510	825	10
Cost per acre of 300 lbs. fertilizer at $32 per ton..........	$ 4.80				
Value per acre of crop over manure only, 89⅚ bush. at 6c. per bushel..........	5 39				
Gain per acre..........	59				
Magnum Bonum—(Pulled November 9).					
½ acre. Manure and fertilizer, 300 lbs. per acre..........		28	60	933	20
" " only..........		27	460	907	40
Cost per acre of 300 lbs. fertilizer at $32 per ton..........	$ 4 80				
Value per acre of crop over manure only, 25⅘ bush. at 6c. per bushel..........	1 54				
Loss per acre..........	$ 3 26				
Sutton's Champion—(Pulled November 11).					
½ acre. Manure and fertilizer, 300 lbs. per acre..........		23	110	768	30
" " only..........		24	380	806	20
Cost per acre of 300 lbs. fertilizer at $32 per ton..........	$ 4.80				
Value per acre of loss in crop over manure only, 37⅚ bush. at 6c. per bushel..........	2 27				
Loss per acre..........	$ 7 07				
Canadian Gem—(Pulled November 13).					
½ acre. Manure and fertilizer, 300 lbs. per acre..........		26	1,780	896	20
" " only..........		26	150	869	10
Cost per acre of 300 lbs. fertilizer at $32 per ton..........	$ 4 80				
Value per acre of gain in crop over manure only, 27⅙ bush. at 6c. per bushel..........	1 63				
Loss per acre..........	$ 3 17				
Rennie's Prize—(Pulled November 15).					
½ acre. Manure and fertilizer, 300 lbs. per acre..........		26	210	870	10
" " only..........		23	990	783	10
Cost per acre of 300 lbs. fertilizer at $32 per ton..........	$ 4 80				
Value per acre of gain in crop over manure only, 87 bush. at 6c. per bushel..........	5 22				
Gain per acre..........	0 42				

FIELD CROP OF TURNIPS—*Concluded.*

Name of Variety. How Fertilized. Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Tons.	Lbs.
Elephant—(Pulled November 16).					
½ acre. Manure and fertilizer. 300 lbs. per acre		25	1,120	852	..
" " only		24	600	810	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre of gain in crop over manure only, 42 bush. at 6c. per bushel	2 52				
Loss per acre	2 28				
Mixed Varieties—(Pulled November 18).					
½ acre. Manure and fertilizer. 300 lbs. per acre		24	200	803	20
" " only		23	1,140	785	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre of gain in crop over manure only, 17⅔ bush. at 6c. per bushel	1 06				
Loss per acre	$ 3 74				

FIELD CROP OF TURNIPS II.

One acre of turnips was grown in 4 lots of ¼ acre each. The land was a light clay loam, the previous crop having been timothy hay. This was ploughed in the fall of 1908 and cultivated well in the spring, after which barn-yard manure at the rate of 20 tons per acre was spread on the surface and ploughed under with the gang plough. This was again thoroughly cultivated and run into rows 24 inches apart. On one half of each lot, complete fertilizer (superphosphate 1½ lbs., bone meal 1½ lbs., nitrate of soda 1 lb., and muriate of potash 1 lb.) was added at the rate of 300 lbs. per acre.

The plants were thinned out to one foot apart in the rows and received one other hoeing besides. They were cultivated with a one-horse cultivator between the rows 4 times during the season. The seed was sown June 11 and the roots were pulled November 2 and 3.

Field Crops of Turnips.

Name of Variety, How Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Improved Elephant—(Pulled November 2.)					
$\frac{1}{8}$ acre. Manure and fertilizer, 300 lbs. per acre		30	320	1,005	20
$\frac{1}{8}$ " " only		27	1,360	922	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre of gain in crop over manure only, 82⅔ bush. at 6c. per bushel	4 96				
Gain per acre	.16				
Magnum Bonum—(Pulled November 2.)					
$\frac{1}{8}$ acre. Manure and Fertilizer, at 300 lbs. per acre		28	160	936	..
$\frac{1}{8}$ " " only		28	200	936	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	4 80				
Value per acre of loss in crop over manure only, 40 lbs. at 6c. per bushel	0 04				
Loss per acre	4 84				
Hartley's Bronze Top—(Pulled November 3).					
$\frac{1}{8}$ acre. Manure and fertilizer, 300 lbs. per acre		29	1,200	986	40
$\frac{1}{8}$ " " only "		29	360	972	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	4 80				
Value per acre of gain in crop over manure only, 14 bush. at 6c. per bushel	0 84				
Loss per acre	3 96				
Kangaroo—(Pulled November 3).					
$\frac{1}{8}$ acre. Manure and fertilizer, 300 lbs. per acre		26	360	872	40
$\frac{1}{8}$ " " only		24	960	816	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	4 80				
Value per acre of gain in crop over manure only, 56⅔ bush. at 6c. per bushel	3 40				
Loss per acre	1 40				

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown in uniform test plots on June 3 and a duplicate set of each on June 17. The land was a clay loam on which timothy hay had been grown the previous year. This was ploughed in the fall of 1908, well cultivated in the spring, and barn-yard manure spread on the surface at the rate of 20 tons per acre, ploughed under with a gang plough, and the land again thoroughly cultivated. Complete fertilizer made up of superphosphate 1½ lbs., bone meal 1½ lbs., nitrate of soda 1 lb. and muriate of potash 1 lb. mixed together and sown at the rate of 300 lbs. per acre was then spread on the surface and harrowed in with the smoothing harrow.

The land was run into rows 24 inches apart and sown with the Planet, Jr., drill in bunches 1 foot apart with from 3 to 6 seeds in each bunch. When the plants were from 2 to 4 inches high they were thinned out, leaving the best plant in each spot, and cultivated between the rows with a one-horse cultivator on an average every ten days up to about July 15. They were gone through twice with the hoe besides thinning.

This crop was pulled October 27 and the yield calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

The following are the results obtained:—

MANGELS—Test of Varieties.

No. of Plot.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Selected Yellow Globe..........	42	975	1,416	15	29	80	9 8	..
2	Yellow Intermediate	42	150	1,402	30	28	430	940	30
3	Giant Yellow Globe......	41	1,655	1,394	15	28	100	935	..
4	Mammoth Red Intermediate....	41	1,325	1,388	45	23	1,255	954	15
5	Half Long Sugar White.........	40	850	1,347	30	33	825	1,113	45
6	Giant Yellow Intermediate......	38	1,550	1,292	30	27	1,605	926	45
7	Crimson Champion..............	37	1,075	1,251	15	29	1,400	990	..
8	Gate Post.................. ...	33	825	1,113	45	27	780	913	..
9	Prize Mammoth Long Red ...	32	1,175	1,086	15	23	200	770	..
10	Perfection Mammoth Long Red.	30	1,875	1,031	15	22	1,705	761	45

FIELD CROPS OF MANGELS.

One acre of mangels was grown in 4 lots of ¼ acre each. The land was a light clay loam, the previous crop having been timothy hay. This was ploughed in the fall of 1908 and cultivated well in the spring, after which barn-yard manure at the rate of 20 tons per acre was spread on the surface and ploughed under with the gang plough. The land was again thoroughly cultivated and run into rows 24 inches apart. On one-half of each lot complete fertilizer (superphosphate 1½ lbs., bone meal 1½ lbs., nitrate of soda 1 lb., muriate of potash 1 lb.) mixed together, was added at the rate of 300 lbs. per acre.

The seed was sown with the Planet Junior seed drill in bunches one foot apart, with from 3 to 6 seeds in each bunch. When the plants were from 2 to 4 inches high, they were thinned out, leaving the best plant in each spot, cultivated between the rows with a one-horse cultivator about 4 times during the season, receiving one hoeing besides. They were sown June 8 and pulled October 28 to November 1.

FIELD CROPS OF MANGELS.

Name of Variety, How Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Mammoth Long Red—(Pulled October 28).					
⅛ acre. Manure and fertilizer, 300 lbs. per acre		23	600	776	40
" " only		22	1,200	753	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, $23\frac{2}{6}$ bush. at 6c. per bushel	1 40				
Loss per acre	$ 3 40				
Yellow Half-Long—(Pulled October 28).					
⅛ acre. Manure and fertilizer, 300 lbs. per acre		25	120	835	20
" " only		23	1,040	784	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, $51\frac{2}{6}$ bush. at 6c. per bushel	3 08				
Loss per acre	$ 1 72				
Yellow Globe—(Pulled November 1).					
⅛ acre. Manure and fertilizer, 300 lbs. per acre		27	480	908	..
" " only		25	1,960	866	.
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 42 bush. at 6c. per bushel	2 52				
Loss per acre	$ 2 28				
Golden Tankard—(Pulled November 1).					
⅛ acre. Manure and fertilizer, 300 lbs. per acre		22	1,280	754	40
" " only		21	1,800	730	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, $24\frac{4}{6}$ bush. at 6c. per bushel	1 48				
Loss per acre	$ 3 32				

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown in uniform test plots on June 3 and a duplicate set on June 17. The land was a clay loam on which timothy hay had been grown the previous year. This was ploughed in the fall of 1908, well cultivated in the spring, and barn-yard manure spread on the surface at the rate of 20 tons per acre. This was ploughed under with a gang plough and the land again thoroughly cultivated. Complete fertilizer (made up of superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.) mixed together and sown at the rate of 300 lbs. per acre was then spread on the surface and harrowed in with the smoothing harrow. The seed was sown in rows 24 inches apart, and the plants thinned out by hand to about 3 inches apart in the rows.

The crop was pulled November 4 and the yield calculated from the weight obtained from 2 rows each 66 feet long.

The following are the results:—

CARROTS.—Test of Varieties.

No. of Plot.	Name of Variety.	Yield per Acre							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	21	405	706	45	18	1,125	618	45
2	White Belgian	21	240	704	..	23	530	775	30
3	Half Long Chantenay	21	75	701	15	19	775	646	15
4	Improved Short White	20	95	668	15	15	1,350	522	30
5	Mammoth White Intermediate	17	1,475	591	15	16	505	541	45

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were sown in uniform test plots on June 3, and a duplicate set on June 17. The land was a clay loam on which timothy hay had been grown the previous year. This was ploughed in the fall of 1908, well cultivated in the spring and barn-yard manure spread on the surface at the rate of 20 tons per acre and ploughed under with a gang plough, and again thoroughly cultivated. Complete fertilizer, (made up of superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb., and muriate of potash, 1 lb.) were mixed together and sown at the rate of 300 lbs. per acre and then harrowed in with the smoothing harrow.

The land was run into rows 24 inches apart and the seed was sown with the Planet Junior drill seeder in bunches 1 foot apart, with from 3 to 6 seeds in each bunch. When the plants were from 2 to 4 inches high, they were thinned out leaving the best plants in each spot, and cultivated between the rows with a one-horse cultivator on an average every ten days up to the middle of July, and gone through twice with the hoe besides the thinning.

This crop was pulled October 27 and the yield calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

The following are the results obtained:—

SUGAR BEETS—Test of Varieties.

No. of Plot	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.		Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.			
1	French Very Rich	14	875	481	15	12	1,410	423	30	16·05	17·97	89·3
2	Klein Wanzleben	13	1,225	453	45	11	605	376	45	16·63	18·67	89·0
3	Vilmorin's Improved	12	1,575	426	15	10	1,945	365	45	17·52	19·83	88·3

EXPERIMENTS WITH POTATOES.

Nineteen varieties of potatoes were planted in uniform test plots. The ground was a clay loam in good condition, having grown a heavy crop of clover hay the previous year. A heavy crop of aftermath was ploughed under in the early fall of 1908

and cultivated once. The land was thoroughly worked up in the spring of 1909, ploughed crosswise and again well worked up. Complete fertilizer (superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.) at the rate of 400 lbs. per acre was applied by scattering in the open rows before planting. No barn-yard manure was used for this crop. The rows were 30 inches apart, and the sets (having at least three good eyes per set) were planted one foot apart in the rows. The drills were harrowed down twice, and rowed up again before the plants came up. The vines were sprayed with Bordeaux mixture three times, with Paris green added to kill the potato beetle. Shortly before digging time, an extremely wet spell of weather was experienced, followed immediately by unusual heat of about one week's duration. This, we believe, was the cause of an unusual amount of rotten and unmarketable potatoes.

There was no blight or scab.

The potatoes were planted June 9 and dug October 14 and 15.

The yield per acre has been calculated from the crop obtained from two rows, each 66 feet long.

The following are the yields obtained:—

POTATOES—Test of Varieties.

No. of Plot.	Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Everett	556	36	424	36	132	..	374	..	182	36	Round, white.
2	Ashleaf Kidney	506	..	374	..	132	..	341	..	165	..	" "
3	Irish Cobbler	475	12	292	36	182	36	235	24	239	48	" "
4	Vick's Extra Early	464	12	420	12	44	..	380	36	83	36	Long "
5	Carman No. 1	462	..	305	48	156	12	343	..	220	..	Round "
6	State of Maine	457	36	343	12	114	24	308	..	149	36	" "
7	Money Maker	448	48	360	48	88	..	292	36	156	12	" "
8	Morgan Seedling	442	12	396	36	72	36	341	..	101	12	Long "
9	Gold Coin	435	36	308	..	127	36	270	36	165	..	Round "
10	Reeve's Rose	420	12	323	24	96	48	268	24	151	48	Long, pink.
11	Rochester Rose	400	24	363	..	37	24	323	24	77	..	Long round, pink.
12	Dooley	387	12	341	..	46	12	310	12	77	..	Round, white.
13	Holborn Abundance	363	..	279	24	83	36	235	24	127	36	" "
14	Late Puritan	360	48	206	48	154	..	173	48	188	..	Long "
15	Dreer's Standard	338	48	283	48	55	..	239	48	99	..	Round "
16	Empire State	336	36	275	..	61	36	248	36	88	..	Long "
17	American Wonder	334	24	235	24	99	..	213	24	121	..	Long round, white.
18	Dalmeny Beauty	321	12	239	48	81	24	220	..	101	12	Oval, white.
19	Uncle Gideon's Quick Lunch	231	..	189	12	41	48	165	..	66	..	Round, pink.

CLOVER EXPERIMENTS.

Experiments were again conducted to determine the gains, if any, from growing clover with grain crops for the purpose of ploughing under the growth of clover made during the previous season. This was a sandy soil in a fairly good state of fertility, having grown roots in 1907, for which crop barn-yard manure had been applied. The land was sown with mixed grain in 1908.

For the past four seasons this experiment had been conducted on the same field, and, for various reasons, a change of place was considered necessary; consequently,

one-half of this field of mixed grain (1908) was seeded with clover and the other half left unseeded, with a view to using it for this experiment in 1909.

The following results were obtained:—

CLOVER EXPERIMENTS.

Number.	Name of Variety and how Seeded.	Yield per Acre. Bush.	Yield per Acre. Lbs.
	Early Riga Wheat—Sown May 26, cut August 30.		
1	Without clover, 1908	20	20
2	With clover, 1908	22	0
3	Without clover, 1908	21	40
4	With clover, 1908	23	20
	Odessa Barley—Sown May 26, cut August 23.		
1	Without clover, 1908	34	28
2	With clover, 1908	36	12
3	Without clover, 1908	35	40
4	With clover, 1908	36	42
	Sensation Oats—Sown May 26, cut Aug. 31.		
1	Without clover, 1908	42	32
2	With clover, 1908	45	10
3	Without clover, 1908	44	04
4	With clover, 1908	43	18

EXPERIMENTS WITH ALFALFA.

Experiments with alfalfa were again conducted, five varieties being used, namely: Montana alfalfa, No. 23454; Grimm's alfalfa, No. 25102; Canadian alfalfa, No. 24836; Sand Lucerne, No. 23394; and *Medicago falcata*, No. 24452.

The land was a heavy clay loam, well drained, on which potatoes had been grown the previous year, and was thoroughly cultivated three times before seeding. Lime at the rate of three casks per acre was spread on the surface of the soil before sowing, and harrowed in.

The seed was all treated with nitro-culture and sown June 5.

No nurse crop was used.

With the exception of *Medicago falcata*, No. 24452, of which the very little that grew was very sickly and made extremely poor growth, all made a good, healthy stand.

This was cut twice during the season, the first time when the plants were about 8 inches high. The cuttings were left on the ground for a mulch, and at the date of writing, March 31, would appear to have come through the winter better than usual, which, however, has never been satisfactory.

FLAX.

One half acre of flax was grown on land that was a rather heavy clay loam on which turnips had been grown the previous year, for which crop barn-yard manure at the rate of 20 tons per acre had been supplied.

The seed was sown June 5 at the rate of 60 lbs. per acre, and the crop was cut August 28, having taken 84 days to mature. The average length of plants was 26 inches, and the yield of seed was 380 lbs., or at the rate of 11 bushels, 32 lbs. per acre

EXPERIMENTS WITH RUN-OUT LAND.

The experiment to determine the practicability of restoring run-out land, where a limited amount of manure is available, was continued this season. This was commenced in the season of 1906 on a field of 8 acres of heavy clay with some little loam, badly run-out and particularly deficient in humus. This field had grown grain, and had been sown to grass sixteen years previous, since when it had been lying in pasture, and producing extremely little after the first three years. The field was made into four plots of 2 acres each.

With a view to making each plot as nearly equal in fertility as possible, the field was divided into 8 parts of 1 acre each, and numbered 1 to 8. Nos. 1 and 8 being designated plot 1, (2 acres); Nos. 2 and 7, plot 2 (2 acres); Nos. 3 and 6, plot 3 (2 acres); and Nos. 4 and 5, plot 4 (2 acres).

On plot 1 no fertilizer was used; on plot 2, 300 lbs complete fertilizer per acre was used. On plot 3, 600 lbs. complete fertilizer per acre was used, and on plot 4, 10 one-horse cart-loads of barn-yard manure was used.

In the season of 1906, this field was sown with peas, oats and vetches, mixed together and sown at the rate of 3 bushels per acre. They were allowed to grow until about August 1, when the entire crop was ploughed under. This was repeated in 1907. In 1908 it was sown with Waverley oats, Odessa barley, and Prussian Blue peas, mixed together and sown at the rate of 3 bushels per care, together with clover and timothy at the rate of 10 lbs. clover and 12 lbs. timothy seed per acre.

The following tables will show the yields of grain obtained in 1908, and also that of clover hay obtained in 1909:—

Yield of Grain, 1908.

No. of Plot.	How Fertilized.	Yield per Plot (2 acres). Bush.	Lbs.	Weight per Bushel Lbs.
1	No fertilizer used	61	04	40
2	300 lbs. fertilizer per acre	78	08	40
3	600 lbs. " "	82	05	40
4	10 one-horse cart-loads manure	95	04	40

Yield of Hay, 1909.

No. of Plot.	How Fertilized.	Yield per Plot (2 acres.) Tons.	Lbs.
1	No fertilize used	2	190
2	300 lbs. fertilizer per acre	2	925
3	600 lbs. " "	2	1,275
4	10 one-horse cart-loads manure	3	325

EXPERIMENTS WITH FERTILIZERS ON MARSH.

Further experiments with lime and commercial fertilizers on marsh or dyke lands were commenced this year as usual along the same lines as last year, but, owing to the breaking of the dykes in September and the overflowing of the dyke lands, no record was obtainable.

HAY CROP.

The hay crop was fairly well up to the average on upland, but not by any means up to the average on marsh, except where it was the first crop.

Twenty-six acres on upland yielded 57 tons, 980 lbs.

Forty-two acres on marsh yielded 68 tons, 175 lbs.

SUMMARY OF CROPS GROWN, EXCLUSIVE OF UNIFORM TEST PLOTS OF GRAIN AND POTATOES.

HAY.

	Tons.	Lbs.
Upland hay	57	980
Marsh hay	68	175
	125	1,155

GRAIN.

	Bush.	Lbs.	Lbs.
Mixed grain	396	20	15,860
Oats	364	18	12,394
Barley	65	..	3.120
Buckwheat	203	..	9,744
			41,118

TURNIPS.

	Bush.	Lbs.	Tons.	Lbs.
Turnips (field crop)	7,792	50	233	1,570
Turnips (test plots)	254	10	7	1,250
	8,047	..	241	820

MANGELS.

	Bush.	Lbs.	Tons.	Lbs.
Mangels (field crop)	801	..	24	60
Mangles (test plots)	166	40	5	..
	967	40	29	60

CORN.

	Tons.	Lbs.
Corn (field crop)	25	1,750
Corn (test plots)	10	1,620
	36	1,370

FRUIT AND VEGETABLE CROPS.

APPLES.

The apple crop was very much below the average this year, and the quality of the fruit inferior to that grown the previous year, possibly owing to the lack of sunshine not allowing the fruit to ripen well.

Strawberries.

The strawberry plants came through the winter very well, but, owing to a particularly dry season up to the end of June, the vines did not promise a large crop. However, some showers coming at the latter end of June and the beginning of July improved the fruit and a fair crop of good-sized berries was picked. The earliest picking was July 7, three days later than in 1909. The size of the plot of each variety was 16½ x 5 feet.

Following are the yields from 20 of the most productive varieties:—

Strawberries—Test of Varieties.

Variety.	Dates when Picked.					Yield per Plot.	Yield per Acre.
	July 7.	July 10.	July 14.	July 16.	July 26.		
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.
Gandy	2	1	7	11	10	31	16,368
Barton's	1	3	7	12	6	29	15,312
Clyde	½	4	14	6	4	28½	15,048
Swindle	2	2	9	8	7	28	14,784
G. H. Coughell	....	3	8	8	7	26	13,728
Pearl	1	1	10	6	7	25	13,200
Bisel	1	....	8	10	5	24	12,672
Minute Man	1	2	7	6	7	23	12,144
Maggie	2	4	7	4	6	23	12,144
Parker Earle	1	2	9	6	4	22	11,616
Pocomoke	1	....	6	10	5	22	11,616
John Little	3	4	7	5	3	22	11,616
Princess	2	....	9	7	3	21	11,088
Beverley	1½	2	7	7	3	20½	10,824
Enhance	....	3	4	8	5	20	10,560
Afton	....	....	8	5	7	20	10,560
Early Beauty	4	4	6	3	1½	18½	9,768
Capt. Jack	1½	3	4	8	1	17½	9,240
Jas. Vick	....	4	5	5	3	17	8,976
Seneca Queen	....	4	6½	4	2	16	8,448

GARDEN CROPS.

PEAS.

Experiments were again conducted with six of the leading varieties of garden peas.

The seed was sown on May 28, in plots each 66 feet long by 2½ feet wide, 2 inches apart in the rows, and about 2 inches deep. As each variety became ready for use, the date was recorded, and the yield of green pods from the several pickings entered.

The yields were as follows:—

GARDEN PEAS—Test of Varieties.

Variety.	Date of Picking and Yields.				Total Yield from Plots.	
	August 8.		August 15.			
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Thomas Laxton	12	8	6	8	19	..
Gradus	12	8	4	4	16	12
American Wonder	13	..	2	4	15	4
Telephone	10	8	3	8	14	..
Stratagem	10	8	5	8	14	..
Prosperity	8	..	3	..	11	..

GARDEN BEANS.

Six varieties of garden beans were grown this year. The seed was planted in rows 33 feet long, being dropped 2 inches apart in the rows. A duplicate plot of each variety was planted to ripen for seed.

Owing to the extremely wet season, the beans ripened very unevenly and were much rusted, consequently no record was kept of the ripened seed.

The following yields of green beans were gathered, when fit for market:—

GARDEN BEANS—Test of Varieties.

Variety.	Date of Picking and Yields.						Total Yield from Plots.	
	Aug. 5.		Aug. 16.		Aug. 23.			
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Golden Skinless	14	0	4	0	3	8	21	8
Fame of Vitry	12	8	5	8	2	0	20	0
Dwarf Extra Early	12	8	5	8	1	8	19	8
Emperor of Russia	10	8	4	8	2	0	17	0
Dwarf Matchless	8	0	6	0	3	0	17	0
" Wax	8	8	4	0	3	0	15	8

TOMATOES.

Ten varieties were planted. These were started in hot-beds on March 27, and kept in a cold frame from April 30 to June 16, when eight plants of each variety were planted in the field, 4 feet apart each way.

About the time the fruit formed, they were struck with blight, six of the ten varieties so much so as to be almost ruined, no record being kept of them.

The following is a list of all varieties sown, together with the yields of the remaining four:—

Flower Beds and part of Orchard. Experimental Farm, Nappan, N.S.

16—p. 328

TOMATOES—Test of Varieties.

Variety.	Ripe Fruit.	Green Fruit.	Yield per plot.
	Lbs.	Lbs.	Lbs.
Chalk's Early Jewel	126	224	350
Golden Queen	34	222	256
Atlantic Prize	37	150	189
Coreless		60	60
June Pink	Badly.	Blighted.	
Matchless	"	"	
Livingston Beauty	"	"	
Spark's Earliana (Ottawa)	"	"	
" " (Burpee)	"	"	
Ponderosa	"	"	

HORSES.

The horses on the Farm are kept exclusively as work animals, no experiment of any kind being carried on. No change has been made in the number during the past year, which is eight, consisting of three teams of draught horses, one express horse, and one driver. All are in good condition.

CATTLE.

STEER-FEEDING EXPERIMENT.

With the exception of one cow kept for milk purposes, all the cattle on the Farm consist of grade steers, bought in the fall for fattening purposes, with the intention of selling again in the spring. The number fed this year was 64 head. They were bought in October and the early part of November, dehorned, and put under experiment December 1. The weight credited to them at the beginning of the experiment was the weight found at 9 a.m. without their having received any food since 7 p.m. the previous evening. For the first thirty days, beginning November 15, they were fed large quantities of roots and clover hay, the object being the getting of them into proper condition to make the best use of meal feeds. By December 15, they were being fed 60 lbs. of turnips per day per steer. From December 15 to January 15, 1 lb. meal per day per steer was added. From this time to the time of writing the meal feed has been increased 1 lb. per day per steer each month, while the roots have been decreased 10 lbs. per day per steer each month.

A very satisfactory sale for May delivery has already been made.

	Lbs.
Total live weight of 64 steers, December 1, 1909	64,410
Total live weight of 64 steers, March 31, 1910	77,675
Increase	13,265
Average daily gain per steer	1·72

COMPLETION OF STEER FEEDING EXPERIMENT OF 1909, FINISHED SINCE LAST REPORT.

On making my report to March 31, 1909, the 53 steers under experiment were still on hand. The following is a continuation and conclusion of said experiment:—

EXPERIMENT WITH STEERS. 1909, UNFINISHED IN LAST REPORT.

	Lbs.
Total live weight of 53 steers, Nov. 16, 1908..	56,400
Total live weight or 53 steers, March 31, 1909..	66,420
Increase to March 31, 1909..	10,020
Total live weight of 53 steers, April 30, 1909..	69,205
Increase to April 30, 1909, total..	12,805

FINANCIAL RESULTS.

Original weight of 53 steers, 56,400 lbs. at 4·32 cts. per lb.	$2,436 93
Weight at finish of 53 steers, 69,205 lbs. at 5·65 cts. per lb.	3,910 08
Gross profit..	1,473 15
Cost of feed for lot 165 days..	1,268 03
Net profit..	205 12

Daily rate of gain per steer, 1·46 lbs.
Cost of 1 lb. gain per steer, 9·90 cts.
Cost of feed per day per steer, 14·5 cts.
Profit per steer, $3.87.

SHEEP.

Twenty-five sheep are now on hand, representing Shropshires, Leicesters, and their grades as follows:—

13 Shropshires.
6 Leicesters.
6 Grades.

Owing to the small area of pasture available, and the difficulty of increasing it without a great deal of fencing, and rearranging of methods, it has not seemed advisable to increase the flock to any material extent. Only the desirable ewe lambs have been kept, while about an equal number of the old ewes have been disposed of. No lambs were dropped this season by the Leicester ewes.

POULTRY.

Four breeds of poultry are now kept on the Farm, *i.e.*, Barred Plymouth Rocks, White Leghorns, White Wyandottes and Buff Orpingtons.

The pens were made up as follows:—

	Cocks.	Hens.
Barred Plymouth Rocks..	1	9
White Leghorns..	1	8
White Wyandottes..	1	3
Buff Orpingtons..	1	4

The number of eggs laid by the different breeds during the year is as follows:—

	Eggs.	Average.
8 B. P. Rocks..	736	92
4 W. Wyandottes..	320	80
10 W. Leghorns..	900	90
6 Blk. Minorcas..	400	$66\frac{2}{3}$

The strain of Minorcas on the Farm was not considered a good one and the birds were exchanged for the Buff Orpingtons mentioned above.

BEES.

As mentioned in my last report (1909), an experiment to determine the effect, if any, that wintering bees on the coarser native fall honey, as against sugar syrup, would have on them during the spring, was carried on. Two sets of three colonies each were used. The first set had their sealed stores left them undisturbed, the second set were fed sugar syrup, made from the best granulated sugar, two parts sugar to one part water by weight. To make this syrup, the water was first boiled and the sugar then stirred in. The Miller feeder was used in a shallow extracting super.

After March, the clusters broke and the bees were moved to their summer stands in April. A good deal of dysentery was found in those hives which had wintered on the native stores, and but a very little in one hive only that was wintered on sugar syrup. The experiment so far had been very much in favour of the syrup feeding.

During April and May we had much cold and wet weather, the alternating fine and damp days having an injurious effect, causing great loss from spring dwindling. The loss from this cause was quite as great in those hives where syrup was fed as where honey was used during the winter, leaving both lots in poor shape to take advantage of the clover season, which was very short here. The latter end of June and the month of July was ideal growing weather, with plenty of heat, but also with plenty of rain, indeed rain fell on half the days in the latter month, much hindering the gathering of clover honey. During September, when we get our flow from the fall flowers, the weather again was cold and wet. The result was that very little honey was extracted.

Nine colonies were put into the cellar in strong shape on December 14, 1909. The covers and quilts were removed from the hives and three empty grain bags put over each and the body raised from the bottom board at the entrance with a 2-inch block. This method of caring for the bees during the winter has been so successful, that it is being generally adopted in Nova Scotia, the raised entrance and the dry open bags on top allowing such good ventilation, that we never see any appearance of mildew on the frames.

At the date of writing, March 31, 1910, all colonies are quiet and clustering on the frames.

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed this year to farmers who made application.

The following number of three pound packages were sent out for trial:—

Potatoes	252
Oats	350
Barley	57
Wheat	46
Buckwheat	25
Total number of samples sent out	730

AGRICULTURAL MEETINGS ATTENDED.

During the year I attended and delivered addresses at the following meetings:—

Scotsburn, Pictou Co., N.S.
River John, Pictou Co., N.S.
Sussex Dairy School, Kings Co., N.S.
Antigonish, Antigonish Co., N.S.
Miscouche, P.E.I.

Lot 16, P.E.I.
Collingwood Corner, Cumberland Co., N.S.
Maccan, Cumberland Co., N.S.
Summerside, P.E.I.
North Bedeque, P.E.I.
Freetown, P.E.I.
Truro Agricultural College Short Course, Truro, N.S.
Newville, Cumberland Co., N.S.
Halfway River, Cumberland Co., N.S.
Millvale, Cumberland Co., N.S.
New Glasgow, Pictou Co., N.S.
Fredericton, York Co., N.B.
Chatham, Northumberland Co., N.B.
Nappan, Cumberland Co., N.S.
Diligent River, Cumberland Co., N.S.

EXHIBITIONS.

As usual an exhibit of farm products was made at the New Brunswick Provincial Exhibition, at Fredericton, N.B., and at the Nova Scotia Provincial Exhibition, at Halifax, N.S. I also attended the Middleton Exhibition, the Sackville and Westmorland County Exhibition, and the Port Elgin Exhibition.

CORRESPONDENCE.

During the year 2,301 letters were received and 2,011 sent out, exclusive of reports, and circulars sent out with samples of grain.

VISITORS.

While a great many visited the Farm during the year, they were not nearly so numerous as in former years, on account of the many unsuitable train connections, no train going westward after 12 a.m. stopping at this station, making it practically impossible for visitors to reach here except by driving.

We are negotiating with the railway officials and hope to have the train arrangements improved this coming season.

WEATHER.

April, 1909, opened with fine weather until the 4th, when seven inches of snow fell. Snow fell on the 9th and again on the 26th, 2½ inches falling each day. Total snowfall for month, 12 inches.

Light rains fell on seven different dates, making a total rainfall of 2.37 inches for this month.

There were but seven days during this month that frost was not registered, the lowest being on the 6th, when 17° was registered.

May.—Rain fell on twelve different dates during this month, but none of the showers were heavy, the total rainfall being 3·06 inches. The balance of the month was fine but cold, frost being registered as late as the 26th. The actual sunshine for this month was ·52 of the possible number of hours.

Seeding commenced on the 25th, five days later than in 1908.

June was fine and very dry, no rain falling until the evening of the 12th, when ·03 inches fell. On the 18th ·05 inches fell, on the 21st ·03 inches fell, and on the 24th ·04 inches. The lowest temperature recorded was 31° on the 2nd, the highest

being 85° on the 26th. The actual sunshine for this month was ·73 of the possible number of hours.

July.—The weather during this month was very favourable to growing crops. Light rains fell on 13 different dates during the month, the total rainfall being 1·73 inches. The thermometer registered 80° or above on 8 different days, the highest being 85° on both the 27th and 28th, the actual sunshine was ·53 of the possible number of hours.

August.—From the first to the 9th was a series of fine days with high temperatures, the highest being on the 8th when 87° was registered. Rain fell on the night of the 9th, from when until the 12th, over 2 inches fell. On the 18th, ·45 inches, and from the 25th to the 29th 1·05 inches fell, making a total for the month of 3·66 inches. The balance of the month although clear, was comparatively cool, the mercury hovering between 59° and 70°. The actual sunshine was ·65 of the possible number of hours.

September.—The weather during this month was very wet and cold. Rain fell on 12 different dates, the total rainfall being 4·07 inches. Frost was registered on the 20th, the highest temperature for this month being 79° on the 24th, actual sunshine being ·55 of the possible number of hours.

October.—With the exception of six days from the 5th to the 11th, the weather during October was very dull, rain falling on 12 different dates, with only 46 hours of sunshine during the last two weeks. Frost was registered on the 21st and 22nd and again on the 30th and 31st, when the thermometer fell to 24°. The actual sunshine was only ·45 of the possible number of hours.

November.—This was not a good month for getting fall farm work done. The weather was dull with considerable rainfall, 3·34 inches having fallen. Frost was registered on 17 different dates, the lowest being on the night of the 20th when the mercury dropped to 16°. The actual sunshine was only ·25 of the possible number of hours.

December was very broken, with light rains and snow falls. The heaviest snowfall was on the 21st when 12 inches fell, making good sleighing. The snowfall for the month was 28 inches, and total precipitation 4·63 inches. At no time during the last two weeks did the thermometer rise above 32°. The lowest temperature recorded was on the 29th, when the mercury dropped to 13° below zero. The temperature on the 30th was 14° above zero and on the 31st 1° below zero.

January, 1910.—January was very seasonable until the 19th, from which date until the end of the month rain fell on 10 different dates, taking off the snow and causing high temperatures until the 30th. The heaviest snowfall being 3 inches on the 31st, and the heaviest rainfall being ·61 inches on the 25th. Total precipitation for the month was 3·86 inches. There were only 21 hours of sunshine during the last two weeks of this month.

February was a typical winter month with barely snowfall enough to keep roads good, and no great amount of rain. The highest temperature was 43° on the 21st and 27th, and the lowest was 16° below zero on the 26th. The total precipitation for the month was 3·73 inches.

March was very mild with unseasonably high temperatures and a fair amount of sunshine. The ground was bare all the month. Rain fell on 9 different dates, making a total rainfall of 2·37 inches for the month.

METEOROLOGICAL RECORDS.

Month.	Degrees of temperature F.					Sunshine.
	Highest.	Date.	Lowest.	Date.	Mean.	Hours.
1909.						
April	63·0	14	17·0	6	36·28	178·5
May	73·0	28	29·0	17	47·83	242·5
June	85·0	26	31·0	2	59·41	346·0
July	85·0	28	41·0	3	63·85	252·0
August	87·0	8	43·0	31	63·14	286·0
September	79·0	24	32·0	20	58·56	208·0
October	75·0	9	24·0	31	47·93	154·0
November	65·0	3	16·0	20	38·36	116·5
December	40·0	4	— 13·0	29	24·78	56·5
1910.						
January	53·0	29	— 10·0	1	23·32	83·5
February	43·0	21	— 16·0	26	20·12	115·5
March	47·0	20	10·0	3	31·48	176·0
Total number of hours sunshine						2217·0

PRECIPITATION.

Month.	Rainfall.	Snowfall.	Total Precipitation.
	Inches.	Inches.	Inches.
1909.			
April	2·37	12	3·57
May	3·06	....	3·06
June	1·08	....	1·08
July	2·68	....	2·68
August	3·66	....	3·66
September	4·07	....	4·07
October	4·16	....	4·16
November	3·34	....	3·34
December	1·83	28	4·63
1910.			
January	3·86	9	4·76
February	1·63	21	3·73
March	2·37.	....	2·37
Totals	34·11	*70	41·11

* Ten inches of snowfall is reckoned as equivalent to 1 inch of rainfall.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

Superintendent.

EXPERIMENTAL FARM FOR PRINCE EDWARD ISLAND

J. A. CLARK, B.S.A., SUPERINTENDENT.

CHARLOTTETOWN, P.E.I., March 31, 1910.

DR. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of the work done on the Experimental Farm for Prince Edward Island at Charlottetown, since possession was obtained of a part of the property in August, 1909.

DESCRIPTION OF FARM.

The farm was bought by the provincial government and leased to the federal Department of Agriculture. Possession was given of the 'Ravenwood' property August [illegible], 1909, and of the several other properties January 28, 1910. The east part of the Johnson property, though conveyed, is held by Mr. Albert Mutch under a former lease, which does not expire for seven years. The Beers property, though promised, can not be conveyed at present.

The properties included in the farm now held by the federal government are as follows:—

		Acres.
The Pope property (Ravenwood)..		29·5
The Chandler property..		6·143
The Gay property..		2·2
The Blake property..		14·71
The west part of the Johnson property..		4·9
		57·45
Properties to be included later:—		
	Acres.	
The east part of the Johnson property..	6·85	
The Beer property..	1·5	
		8·35
In all..		65·8

These properties extend from the corporation limits of the city of Charlottetown north along the east side of the Prince Edward Island Railway to the De Blois road, a distance of about three-quarters of a mile. They occupy all that block of land, which lies between the railway on the west, the Mount Edward road on the east, the De Blois road on the north, and the corporation limits of Charlottetown on the south, with the exception of nine acres on the northeast corner which is owned and occupied by Judge R. R. Fitzgerald.

The cross-road from St. Avards to Gaytown passes through the Farm between the Pope and Chandler properties.

The Chandler and Gay properties are in very good condition, having been well covered with a clover sod during the autumn of 1909 with the exception of three small, low areas which need drainage. The greater part of the Pope property was in very poor condition; the land had been overcropped without being manured, noxious weeds and natural grasses had possession; the orchard was neglected and the hedges so dilapidated that they had to be removed. About ten acres of this property is woodland, covered in the main with a strong vigorous growth of hardwood and a dense undergrowth of fir and spruce. An acre and a half along the cross-road from St. Avards was swamp, grown up with trees of tamarack, spruce and birch. On the high ground to the northwest of the buildings there is a pond, below this the soil is a good sandy loam until near the margin of the railway, where there is about an acre of light soil which is wet the greater part of the summer. The soil, with these exceptions, is a sandy loam and should, when in condition, be very suitable for experimental purposes as it represents the average type of soil on Prince Edward Island. The west part of the Johnson property is quite mossy. It has been in pasture for about fifteen years. This land slopes towards the west and, from the base of the hill to the railway, is wet and needs draining. A tile drain running parallel with the base of the hill would probably carry off this seepage. The Blake property was partly under roots last season, the remainder, which was in grain, will require to be drained. The soil is a sandy loam with areas of clay loam and underlaid with a heavy brick clay. It is fairly uniform in character and should be a good place to conduct variety tests. There are two small ponds near the De Blois road formed by excavating brick clay for pottery.

CHARACTER OF SEASON.

In the spring of 1909 the snow and ice went early from the fields and rivers There were but few hot days, the weather was dull, dry and cold, due largely to heavy bodies of sea-ice along the north shore of the province. Seeding was late. The grasses and clovers remained almost at a standstill during the last half of May and the most of June. July and the early part of August was beautiful growing weather. The hay crop was saved in splendid condition. Great difficulty was experienced in harvesting the grain and root crops owing to an unusually wet harvest time and autumn. Winter began with very heavy snow falls, which lay level over the fields. This was followed by a great January thaw, which took almost all the snow away very quickly, there being no frost in the ground. The remainder of the winter has been remarkably mild, the thermometer reaching zero only occasionally and for very short periods of time.

WEATHER.

On April 4, 1909, 4 inches of snow fell; the weather from that on was fine and mild the 14th being very warm. On the 15th, 1 inch of rain fell; from that to the end of the month it was dull and cool. Rain fell on the 19th, 22nd and 23rd, and there were snow flurries on the 17th and 29th.

May was showery and cool with only two frosts, 1° on the 17th and on the 21st 5° of frost. Seeding became general about the 15th.

June came in cool, fine and dry and remained so until the middle of the month; light showers fell on the 14th, 15th, 18th, 21st, 24th, 25th, and 28th.

July commenced with pleasantly warm temperatures and occasional light showers; on the 9th and 19th heavy rains fell.

August was fine and dry up to the 8th. From then until the evening of the 11th 5¼ inches of rain fell. The weather during the remainder of the month was more or less broken.

September was wet.

October began cool with heavy rains. The first frost came the 8th, 3 degrees. The whole month was cold and wet; five days only without rain. The first snow fell on the 30th.

November had much cloudy, wet weather. There was no frost that stopped the plough.

December came in rough, with rain. On the 20th, winter weather commenced; two feet of snow fell between that date and the 23rd; during the remainder of the month more snow fell.

January, 1910, opened bright and clear with occasional snow flurries, followed by some rain. A smooth coat of about two feet of packed snow lay everywhere without any frost being in the ground. On the 18th a thaw commenced which carried away almost all the snow. The remainder of the month was mild with high temperatures.

February began very mild, turning a little colder by the 8th, when the thermometer registered zero. The weather was fine and bright up to the 18th, when about 8 inches of snow fell. The month ended clear and frosty.

March came in fine and mild; light falls of snow were followed by a thaw, which took away almost all the snow by the 15th. The warmest day was the 20th, 46 degrees above zero. The month closed bright.

FENCES.

There was no satisfactory fence on the Farm when possession was taken. New fences have been erected along the entire railway side of the Farm and on either side of the cross-road from St. Avards.

BUILDINGS.

A two-story residence on the Pope property has been put in a thorough state of repair for the Superintendent. It contains ten rooms, one of which is to be used as an office. The largest barn was repaired temporarily and the roof tightened to keep the machinery and horses dry during the winter. The other outbuildings are of very little value.

GENERAL WORK.

All of the cleared land (about 19 acres) on the Pope property was broken during the autumn of 1909. Several rows of large trees, together with the cross-fences, were removed and the stumps taken out. The orchard and garden were cleaned up, all the rubbish being burned. Some large trees that were overhanging the house were stumped out. The swamp land on either side of the road from St. Avards was cleared of trees and the wood cut up for firewood. A drainage well was sunk in the swamp and a silt basin built. This well and the drains that were opened have taken off all the surface water near them. The Fairbank scales, supplied from the Central Farm at Ottawa, was placed on a cement foundation near the entrance to the barn. More than seven hundred feet of galvanized iron pipe was laid below the frost (all joints being carefully leaded and boxed with cement) to carry the city water from the Mount Edward road main to the house and barn. A sewage system was also laid from the house to a cesspool. About 100 tons of manure has been hauled from the city.

HORSES.

Two horses have been bought for the Farm—a heavy driving horse, six years old, and a heavy draft mare, five years old. The remaining horses needed will be purchased later.

TREES, SHRUBS AND PLANTS.

An acre of sod land was prepared as well as was possible under the circumstances between the house and the Mount Edward road and the following material, supplied from the Central Experimental Farm at Ottawa, was set out or placed in nursery rows on November 10, 11 and 12, 1909, to be ready for planting in the spring of 1910:—

50 Japan Barberry (*Berberis Thunbergii*).
50 Ginnalian maples (*Acer ginnala*).
A collection of Irises of twenty-six varieties.
A collection of Asters of twenty-four varieties.
Platycodon, white, two specimens
Platycodon, blue, five specimens.
10 *Syringa Japonica.*
10 *Syringa Emodi.*

A plantation of currants was made, the bushes being put out in rows, 6 feet apart in the rows. In the collection there were fifteen varieties of black currants, fifteen varieties of red currants and six varieties of white currants. A number of rose bushes, pæonies, perennial phlox, daffodils and lilacs were removed from an old garden formerly in use and were placed in the nursery rows.

EXHIBITIONS AND SEED FAIRS.

I have attended the following exhibitions and seed fairs, judging and giving addresses: Summerside, County Exhibition, Sept. 17 and 18, 1909; Charlottetown, Provincial Exhibition, Sept. 20 to 24, 1909; Georgetown, County Exhibition, Sept. 30, 1909; Egmont Bay, Institute Exhibition, Oct. 19, 1909; Tracadie, Institute Exhibition, Nov. 3, 1909; Maritime Live Stock Show, Amherst, N.S., Dec. 6 to 10, 1909; Prince Edward Island Fruit Growers' Association and Fruit Show, Dec. 3, 1909; Prince Edward Island Poultry Show, Jan. 5 to 7, 1910; Georgetown Seed Fair, Mar. 7, 1910; Summerside Seed Fair, Mar. 9 to 11, 1910.

AGRICULTURAL MEETINGS.

I have attended and delivered addresses at the following Farmers' Institute meetings: Central Lot 16, Prince county, Dec. 15, 1909; Miscouche, Prince county, Dec. 16, 1909; Park Corner, Queens County, Dec. 20, 1909; Malpeque, Prince county, Dec. 21, 1909; New Glasgow, Queens county, Jan. 10, 1910; Clyde River, Queens county, Jan. 15, 1910; Morell Rear, Kings county, Jan. 17, 1910; Hazlebrook, Queens county, Feb. 1, 1910; Alberry Plains, Queens county, Feb. 2, 1910; Fredericton, Queens county, Feb. 7, 1910; Rustico, Queens county, Feb. 9, 1910; North Milton, Queens county, Feb. 10, 1910; Tracadie, Queens county, Feb. 11, 1910; Bloomfield, Prince county, Feb. 14, 1910; Palmer Road, Prince county, Feb. 15, 1910; Springfield, Lot 8, Prince county, Feb. 16, 1910; Glenwood, Prince county, Feb. 16, 1910; West Devon, Prince county, Feb. 17, 1910; Coleman, Prince county, Feb. 17, 1910; Polo Bay, Kings county, Feb. 22, 1910; Red House, Kings county, Feb. 23, 1910; St. Margarets, Kings county, Feb. 24, 1910; Kingsboro, Kings county, Feb. 25, 1910; Marshfield, Kings county, Feb. 28, 1910; Grand River, Prince county, March 2, 1910; Tyne Valley, Prince county, Mar. 2, 1910; North Tryon, Prince county, Mar. 3, 1910.

DAIRY MEETINGS.

Stanley Bridge, Queens county, Feb. 8, 1910; Charlottetown, P.E.I., Dairymens' Association, Feb. 22, 1910.

METEOROLOGICAL RECORDS.

Months.	Temperatures F.					Rainfall.		Snowfall.		Total Precipi-tation.	Bright Sunshine.
	Maximum.		Minimum.		Monthly Mean.						
1901	Date.	°	Date.	°	°	Days	In.	Days	In.	Inches	Hours.
April.....	14	59	12	21	35·9	10	2·75	7	14·5	4·2	158
May.......	28	72	1	30	46·3	16	3·1	0	0	3·1	191
June.......	26	87	2	37	60·3	6	·73	0	0	·73	281
July.......	29	86	3	49	66·1	11	3·31	0	0	3·31	242
August.....	8	87·5	31	45	66·2	11	5·54	0	0	5·54	265
September..	24	78	20	41	60·1	11	3·84	0	0	3·84	187
October.....	9	71	31	32	50·1	17	7·27	1	·6	7·33	97
November ..	4	59	20	21	39·5	14	2·18	4	2·4	2·42	101
December...	4	41	29	4	28·1	8	2·06	16	43·8	6·44	20
1910											
January	29	47	14	8	24·2	10	3·24	8	15.2	4·76	59
February ...	27	41	25	0	21·2	4	1·54	7	20·7	3·61	105
March......	20	46	7	14	30·1	8	1·64	5	10·6	2·7	146·6
Total annual						126	37·20	48	107·8*	47·98	1,852·6

*Ten inches of snowfall is reckoned as equivalent to one inch of rainfall.

CORRESPONDENCE.

For the eight months ending March 31, 1910, there were 160 letters received and 22 sent out, not including circulars.

I have the honour to be, sir,

Your obedient servant,

J. A. CLARK,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA

REPORT OF JAS. MURRAY, B.S.A., SUPERINTENDENT.

BRANDON, MAN., March 31, 1910.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith the twenty-second annual report of the Experimental Farm for Manitoba at Brandon, giving the results of experiments undertaken during the past year.

The winter of 1908-09 was unusually severe and steady in Manitoba and the spring backward and cold. The snow disappeared early in April, but sharp frost at night continued until the end of the month, so that there was very little growth before the first of May. During April, there were only two days on which any work could be done on the land, and it was May 5 before the work could be continued uninterrupted by frost.

When the weather finally did warm up early in May we had splendid growing weather. The soil was well supplied with moisture and the temperature seldom dropped to freezing. Frost was registered on May 16, when six degrees were recorded. and again on June 14, four degrees. No appreciable damage was done by either of these frosts. Growing conditions during May continued so favourable that, by the first of June, crops were little behind what they had been on that date of the previous year, when seeding started three weeks earlier.

During the early part of June, the precipitation was less than usual and, by the time rain fell on the 25th and 26th, late-sown crops were in need of moisture but did not suffer.

Frequent timely rains with warm weather through July gave continuous good growth and, by the end of the month, all crops were well advanced and the early varieties of wheat and barley were beginning to colour.

August was unusually dry. The mean temperature for the month was 66·2 degrees, and on only two days did it fail to reach 70 degrees, while it was over 80 degrees on eighteen days. Less than half an inch of rain was registered during the month and this all fell during the first week. In many parts of Manitoba, the dry weather set in much earlier and the excessive heat ripened the grain so quickly that the yield and quality were seriously affected. The loss from this cause was not so great on the Experimental Farm or in this district, as in many parts of Manitoba, but was considerable.

Harvest started on August 10, and continued without interruption until completed. The harvest and threshing season was favoured with unbroken fine weather, and the crop in all parts of the province was saved without loss and in good time. Threshing was completed about a month earlier than usual.

The first frost was registered on August 29, when the temperature dropped to 30·5 degrees. No damage was done to grain, but the crop of corn was affected as well as some of the garden crops. No more frost was recorded until September 22.

The exceedingly dry weather during August and September left the ground hard and dry for fall ploughing but as threshing was completed early, fully the usual amount of ploughing was done before the winter set in.

The first snow fell on November 11, but severe weather did not commence until two weeks later. December was the coldest month of the winter and the most stormy. The unusually low temperature of 45 degrees below zero was recorded on December 9. The remainder of the winter was almost ideal, the only extremely cold snap being fourteen days in February. The sleighing was good until March 10; after this date the snow disappeared very rapidly and the fields were bare by the 18th. The ground being very dry, it absorbed the water as the snow melted and the high land was fit for work by the 22nd. Several rains and a light snowfall prevented any field work being done on the Experimental Farm, but the indications point to a much earlier spring than last year.

EXPERIMENTS WITH SPRING WHEAT.

The crop of wheat in 1909 was very satisfactory, particularly in view of the late date of sowing. The yields under field conditions varied greatly according to the nature of the land, the way it had been cropped, and the variety of grain sown. The heaviest yield was produced on the land that had been summer-fallowed the previous year, but, as is usually the case on this Farm, such crops were badly lodged and difficult to handle.

Spring Wheat—Test of Varieties.

Fourteen varieties were sown this year in uniform trial plots of one-twentieth acre each, on clay loam that had been fallowed the previous year. They were sown May 7 at the rate of one and one-half bushels per acre, and made a most satisfactory growth throughout the season. The dry, hot weather early in August ripened the grain very quickly and no doubt reduced the yield somewhat. The time required to mature was less than usual, owing mainly to the lateness of sowing but partly to the very warm weather in August, which hastened ripening.

There were no new varieties under test this year.

Number of Plot.	Name of Variety.	Date of ripening.		No. of days maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
							In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Pringle's Champlain...	Aug.	15	100	46	Fair . .	3	Bearded . .	4,760	50	10	62⅓	Slightly.
2	Preston.	"	15	100	44	Stiff . . .	3½	" . .	4,490	48	30	62½	"
3	Huron	"	18	103	46	Fair . . .	3½	" . .	5,500	47	40	61½	"
4	Minnesota 188.........	"	15	100	45	Stiff . . .	3¼	" . .	4,920	47	30	60	"
5	Percy. ...	"	15	100	44	"	3½	Beardless.	4,670	46	10	61½	"
6	Hungarian White......	"	17	102	46	Fair . . .	3¼	Bearded . .	4,450	45	50	61½	"
7	Riga..	"	13	98	42	Stiff . . .	3	Beardless.	3,590	45	10	61¼	"
8	White Fife...........	"	21	106	46	"	3	" .	4,530	44	50	61	"
9	Marquis...........	"	14	99	46	"	3	" .	3,670	43	20	63¾	Very slightly.
10	Bishop...............	"	13	98	40	Fair . . .	3¼	" .	3,410	42	10	60½	Slightly.
11	Stanley...............	"	17	102	46	Stiff . . .	3¼	" .	4,950	42	10	60	Very slightly.
12	Red Fife.......... ...	"	19	104	47	"	3	" .	4,190	40	10	62¼	"
13	Chelsea	"	11	96	44	"	3	" .	3,570	37	10	60¼	"
14	Registered Red Fife...	"	19	104	48	"	3	" .	4,900	35	..	59	"

Spring Wheat.—Test of Varieties.

AVERAGE OF FIVE YEARS.

The following table gives the average yield and the average number of days maturing of six of the leading varieties of wheat, all but one for the past five years. Marquis is included in the list although it has been grown for two years only.

Varieties tested.	Average days maturing.	Average yield per acre. Bush.	Lbs.
Preston	118	43	32
Huron	117	41	27
Red Fife	121	41	14
White Fife	122	40	4
Stanley	117	37	11
Marquis (two years)	107	46	15

The average number of days required by Marquis to mature as given in this table is misleading, as the variety has been under test for two years only. As compared with Red Fife there was an actual difference in favour of Marquis of five days in 1908 and six days in 1909. Marquis and Stanley are early beardless varieties. Preston and Huron are early bearded sorts.

FIELD CROPS OF SPRING WHEAT.

Marquis and Chelsea were grown in field lots for the first time last year and gave a very good account of themselves. Six different varieties of wheat were sown in fields of from four to twenty acres each, but, as the conditions of soil were not uniform, the yields are not comparable. The wheat on summer-fallow was much too heavy in straw to be satisfactory, as much of it lodged early and the sample was injured in consequence. Two different lots of wheat were sown on Indian corn stubble and gave splendid crops. The yield was as high as on summer-fallow and the crops were much easier harvested, as there was less straw. To get a good crop of wheat by growing it this way, the land should be manured for the corn and the corn crop cultivated to keep the weeds down. With clean land, it is not advisable to plough for the wheat as the corn stubble keeps the land too open. Harrowing both ways in the spring will break the crust and form a mulch and the seed may then be sown on a firm seed-bed.

The stubble does not interfere with the seed drill, and by harvest time it has decayed and is not in the way of fall ploughing.

The following table gives the acreage, average yield per acre and total yield of the different varieties grown in field lots last year.

FIELD LOTS OF WHEAT.

Variety.	No. of acres.	Yield per acre. Bush.	Lbs.	Total yield. Bush.
Red Fife	20·14	28	53	582
White Fife	4·06	35	10	143
Preston	11·7	23	55	280
Marquis	4·32	52	18	226
Pringle's Champlain	3·2	37	48	121
Chelsea	4·12	36	53	152
		Total		1,504

A considerable quantity of this grain, 568 bushels in all, was sent to the Central Experimental Farm to be distributed in five-pound samples. Fifty-one five-pound samples of wheat were distributed direct from this Farm. There is a considerable demand here for pure seed wheat in quantity and there is a ready market for our surplus stock. During the past winter 441 bushels of wheat have been sold from the

Experimental Farm in lots of from 2 to 5 bushels, for seed purposes. Good strains of the leading varieties are disseminated in this way, and there is less danger of their being mixed with other varieties at harvest or threshing time than where small samples are distributed.

STANDARD AND COMMERCIAL GRADES OF WHEAT.

There is considerable wheat of poor quality produced every year that brings a comparatively low price on the market. There is always a temptation to sow this grain and sell the grain of higher grade.

In order to get some information on the comparative value for seeding purposes of the grains of different grades, samples were secured in the spring of 1908 of the various standard and commercial grades of wheat from Chief Inspector Horn, of Winnipeg. These were sown under uniform conditions on plots of one-twentieth acre each and the yield from each determined. The experiment was repeated in 1909. The conditions for growth as regards weather, soil and moisture-supply were very favourable both seasons. Under more adverse conditions, the differences between the higher and the lower grades might be expected to be greater.

The average results of the two years are given in the following table:—

Grade.	Yield per acre.		Weight per bushel.
	Bush.	Lbs.	Lbs.
No. 1 Hard	39	31	61
No. 1 Northern	39	16	61
No. 2 "	39	56	60½
No. 3 "	38	11	60
No. 4 "	38	1	60
No. 5 "	37	21	60
No. 6 "	35	21	60
Feed	27	21	59

It will be noticed that there is an almost steady decrease in yield from No. 1 Hard to Feed, and that between the lower grades there is a greater difference than between the higher grades. No. 2 Northern is the only grade that seems to be out of place. In 1908, No. 1 Hard outyielded No. 2 Northern, but in 1909 this was offset by a still higher yield from the lower grade seed wheat. No. 2 Northern is always good wheat and may be just as plump and well-matured as a higher grade but merely off colour. This may not affect its value for seed, provided the poor colour has not been caused by weathering that has affected the vitality.

It is the intention to repeat this experiment in 1910.

WINTER WHEAT.

Winter wheat has been sown repeatedly on this Farm but a crop has never been secured. It has usually been completely dead in the spring. On one or two occasions, a few plants were alive and a few sheaves were saved but a satisfactory crop has never been harvested.

Two bushels of Turkey Red wheat was obtained from the Experimental Farm at Lethbridge, Alta., in August, 1909. Three plots were sown on August 15 at the rate of one and one-half, one, and one-half bushels per acre, respectively. A second sowing was made a month later. The grain sown in August germinated well and covered

the ground fairly well by winter time, but that sown in September, owing to the extremely dry weather, did not come up. A good covering of snow lay on the land all winter and disappeared about the middle of March. The plots that were sown in August were very slightly winter-killed where the snow had been deepest but were fresh and green by the end of the month. The late sown grain came up almost as soon as the snow was away, and at the date of this report has made considerable growth.

SMUT PREVENTATIVES.

During the past twenty years, various chemicals have been tested to secure one for the prevention of smut in grain crops. Little difficulty has been experienced in controlling this disease in wheat or in oats, but no practicable method has yet been introduced that will entirely prevent it in barley. The formalin treatment has been found, after numerous trials, to be highly satisfactory. Formalin can now be secured almost everywhere; it is inexpensive, the solution is easily prepared, and its efficiency when properly applied is beyond doubt. One pound of formalin is sufficient to make thirty-two gallons of solution, and this quantity will easily cover forty bushels of wheat, or about twenty-eight of oats. Dipping and sprinkling have given equally good results, but carelessness in either method of treatment is sure to bring disappointment.

Bluestone has been found effective as a re-agent for destroying smut, but its use has not been attended with quite as satisfactory results as formalin. A bluestone solution of the proper strength is prepared by dissolving one pound of bluestone in six gallons of soft water. As with the formalin solution, it makes no difference how this solution is applied so long as every kernel of grain is thoroughly moistened.

Other treatments that have been on trial as preventatives of smut include those with sulphide of potassium, sulphate of iron, agricultural bluestone, massel powder, anti-fungi, salt, and hot water. None of these has proven to be nearly as effectual as either formalin or bluestone. The hot water treatment and the sulphide of potassium both effectively prevented the disease, but the methods of application are too tedious to permit of either treatment coming into general use. Agricultural bluestone and anti-fungi are both mixtures of copper sulphate and iron sulphate, and their effectiveness is dependent upon the proportion of sulphate of copper that they contain, sulphate of iron being of little value as a fungicide.

No satisfactory remedy has yet been discovered for the control of loose smut of wheat. This is a distinct disease from the stinking smut or bunt.

The seed wheat used for this test last year was not very smutty and no smut was observed in any of the plots where it was sown.

EXPERIMENTS WITH OATS.

The ripening season proved to be too hot and dry to give altogether satisfactory results with the crops of oats. They made a strong growth early in the season but ripened very quickly and the grain was lighter in weight than it usually is. Several of the fields that were badly lodged, rusted considerably and this further impaired the quality of the grain.

Oats—Test of Varieties.

Twenty-five different varieties of oats were sown in uniform test plots of one-twentieth of an acre each. The land was a black clay loam that was in fallow in 1908.

The seed was sown on May 13 under excellent soil conditions at the rate of two bushels per acre. The germination was rapid and uniform and the growth until August 1 favourable in every respect. After this date, the extreme heat induced too rapid ripening.

The Registered Banner was grown from registered seed procured from a member of the Canadian Seed Growers' Association in 1908. 'Regenerated' Abundance was obtained from the Garton Pedigree Seed Company, while Orloff was furnished by the Steele Briggs Seed Company.

Daubeney and Orloff are both very early varieties, the former being a white oat, the latter a yellow.

OATS—Test of Varieties.

No. of Plot.	Name of Variety.	Date of ripening.	No. of days maturing.	Length of Straw, including Head	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				In.		In.		Lbs.	Bus.	Lbs.	Lbs.	
1	Improved American	Aug. 13	94	56	Stiff	8½	Branching	4,670	119	24	40½	None.
2	Danish Island	" 14	93	54	"	8½	"	3,860	119	14	40½	Very slightly.
3	Registered Banner	" 13	92	54	"	8½	"	4,470	115	20	39	"
4	Banner	" 12	91	55	"	9	"	4,750	110	20	40½	None.
5	Alaskan	" 12	91	52	"	8	"	3,080	110	20	41	Very slightly.
6	Orloff	" 6	85	38	"	7½	"	2,980	110	..	35	None.
7	Swedish Select	" 13	92	53	Fair	8	"	1,670	109	24	41	"
8	Golden Beauty	" 13	92	50	"	8½	"	1,760	109	14	38½	Very slightly.
9	Twentieth Century	" 11	90	50	Stiff	8½	"	3,150	108	28	41	"
10	Irish Victor	" 14	93	50	"	8	"	3,560	108	18	39¾	None.
11	Pioneer	" 14	93	49	Fair	8	"	2,920	107	2	40	Very slightly.
12	Kendal White	" 13	92	55	"	8½	"	4,400	105	10	40½	"
13	American Triumph	" 12	91	50	Stiff	8	"	2,900	105	10	41	None.
14	Wide Awake	" 13	92	50	Fair	7½	"	1,890	105	..	41	"
15	"Regenerated" Abundance	" 13	92	50	Weak	7½	"	4,240	104	14	40	Very slightly.
16	Siberian	" 11	90	49	Stiff	7½	"	4,050	104	4	40½	None.
17	Improved Ligowo	" 13	92	56	"	8	"	3,080	103	18	41½	Considerably.
18	White Giant	" 14	93	54	Fair	9	"	3,460	99	14	42	Very slightly.
19	Virginia White	" 14	93	50	"	7½	"	2,820	97	2	40½	"
20	Thousand Dollar	" 12	91	52	Stiff	8½	"	2,280	97	2	42½	None.
21	Abundance	" 15	94	50	Weak	8	"	3,280	96	16	38½	Very slightly.
22	Lincoln	" 15	94	47	"	9	"	1,760	80	..	36	Slightly.
23	Milford White	" 14	93	52	"	9½	Sided	3,460	75	30	37¼	"
24	Daubeney	" 6	85	40	Stiff	7	Branching	3,940	69	16	37	None.
25	Storm King	" 12	91	52	"	9	Sided	4,400	66	16	39½	Slightly.

OATS—TEST OF VARIETIES.

AVERAGE YIELD FOR FIVE YEARS.

The following table gives the average yield of a number of the leading varieties of oats for the past five years:—

Variety.	Average days maturing.	Average yield per Acre.		Variety.	Average days maturing.	Average yield per Acre.	
		Bush.	Lbs.			Bush.	Lbs.
Improved American	106	123	1	Abundance	107	109	33
Banner	106	119	27	Thousand Dollar	105	105	10
Danish Island	107	117	28	Storm King	105	91	17
Golden Beauty	108	115	4	Daubeney	89	78	10
Siberian	107	111	32				

Field Lots of Oats.

Three different varieties of oats were sown in field lots, viz.: Banner, Thousand Dollar and Daubeney. The yields as given herewith are not comparable, as the several varieties were sown at different dates and under different conditions.

Variety.	No. of Acres.		Yield per Acre.		Total Yield.
			Bush.	Lbs.	Bush.
Banner	36	83	61		2,188
Thousand Dollar	9	4	72	11	680
Daubeney	7	45	58	8	434
Total					3,302

EXPERIMENTS WITH BARLEY.

The yields of barley both in the plots and in the fields were quite satisfactory. Most of the crop was well advanced before the extremely warm weather set in and the yield was not seriously affected.

The barley crop merits more attention at the hands of Manitoba farmers than it has been heretofore accorded. This it will probably receive as the demand grows for feeding and malting purposes. It is an ideal feed for the production of pork, particularly when fed mixed with small quantities of peas or oil meal. It is largely used as a feed for fattening steers and is excellent for this purpose. Barley has usually been grown in Manitoba as a cleaning crop as it can be sown late in the spring after one or two crops of weeds have been killed with the harrows and cultivator, and be harvested before wild oats have shelled to any extent. It is not usually of the first quality when grown in this way.

Barley will make good use of manure ploughed under in the spring, and, when the barley crop comes off early, the land then may be prepared for wheat the next year. The disc harrow should be used on the stubble as soon as possible after harvest to cover the shelled grain and induce germination. The land may then be fall ploughed and made ready for wheat in the spring.

BARLEY AS A SMOTHER CROP.

Couch grass or Twitch grass (*Agropyrum repens*) is a most difficult weed to eradicate in the heavy soils of Manitoba. It does not usually spread much by seed but mainly by underground root-stalks which are extremely tough and wiry. Summer fallowing is usually resorted to as a means of eradicating persistent weeds, but, with Couch grass, this system is often not effective. In a wet season, it is almost impossible to keep the growth in check, and the cultivation is often just enough to stimulate the plants and make them grow more rapidly. Harrows and cultivators also drag the roots to parts of the field not before infested and thus make conditions worse than before.

In a dry season, summer-fallowing, if done thoroughly, is more effective, but even then it requires great care.

A field which has been more or less infested with Couch grass for some years was summer-fallowed in 1908. The season did not enable us to make satisfactory headway against the weed and, in the fall, the condition of the field was very little, if any, better than it had been the previous spring.

In the spring of 1909, the field was allowed to lie undisturbed until after seeding, by which time there was a strong growth of Couch grass on many parts of it.

The land was then ploughed deeply, about seven inches, and packed firmly. Barley was sown at once, at the rate of three bushels per acre.

The deep ploughing buried the plants well below the surface. as it is a shallow rooter. The conditions for growth were favourable and the barley germinated well and grew rapidly. The growing weather was ideal throughout the greater part of the summer, with the result that there was a rank growth of straw which effectively prevented the Couch grass making headway. The crop lodged considerably, but yielded 642 bushels from 12·2 acres.

By harvest time there was practically no Couch grass to be seen and, as the fall was usually hot and dry, it did not make any growth afterwards.

The success of this trial would indicate that barley may be used to good advantage in controlling Couch grass. The weather conditions throughout the season were very favourable or the results might not have been so fatal to the Couch grass. It is important that the ploughing be fairly deep and that the barley be sown immediately, otherwise it would not make sufficient headway to keep ahead of the Couch grass.

Barley.—Test of Varieties.

Eleven varieties of six-rowed and ten varieties of two-rowed barley were sown in uniform test plots of one-twentieth of an acre each. The land was clay loam that had been fallowed in 1908. The seed was sown May 17, at the rate of two bushels per acre. O.A.C., No. 21 is a selection of Mandscheuri, made at the Ontario Agricultural College, Guelph. It was tested here in 1908 for the first time. No rust was observed on any of the plots, except Danish Chevalier and Invincible, which were slightly affected.

Six-rowed Barley.—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw, including Head	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inch.		Lbs.	Bush.	Lbs.	Lbs.
1	O.A.C. No. 21....	Aug.	8	83	42	Stiff..	3	Bearded	3,660	73	36	49
2	Mensury...............	"	8	83	39	"	3	"	2,870	72	44	50½
3	Mansfield..............	"	9	84	39	Fair..	3	"	3,580	71	12	49¼
4	Yale....	"	10	85	40	Stiff,.	2¾	"	3,720	68	16	50
5	Stella................	"	11	86	35	Fair.. ..	2⅓	"	3,630	67	44	51½
6	Albert..........	"	7	82	33	Weak	2¾	"	3,470	65	40	51
7	Odessa	"	10	85	38	"	3	"	3,200	64	28	50¼
8	Trooper.....	"	11	86	36	Fair..	2¾	"	3,670	64	8	51
9	Oderbruch	"	8	83	35	Weak	2½	"	2,410	62	4	52½
10	Nugent.....	"	9	84	35	Stiff..	2⅓	"	1,560	61	12	51
11	Claude.....	"	8	83	36	"	2½	"	4,220	57	44	49

Two-rowed Barley.—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inch.		Lbs.	Bush.	Lbs.	Lbs.
1	Canadian Thorpe	Aug. 12	87	45	Fair..	3½	Bearded	4,300	65	20	51¾
2	Jarvis....	" 12	87	42	Stiff.. ...	4	"	2,960	63	16	52½
3	Beaver..	" 11	86	40	Fair..	4¼	"	3,820	60	20	51½
4	Gordon................	" 11	86	45	Stiff.. ...	2½	"	4,960	59	8	49½
5	Standwell.............	" 12	87	46	Fair..	3½	"	4,070	58	46	51½
6	Clifford...............	" 10	85	41	Stiff..	3¾	"	3,740	54	28	50½
7	Danish Chevalier	" 15	90	37	Weak	3½	"	3,880	50	20	50
8	French Chavalier......	" 11	86	42	Stiff..	3¼	"	3,760	50	..	51½
9	Swedish Chavalier.. ...	" 13	88	37	Weak	4	"	6,860	47	6	50½
10	Invincible.....	" 15	90	38	Fair..	3½	"	4,340	43	46	52

Barley.—Test of Varieties.

AVERAGE YIELD IN FIVE YEARS.

Following is a list of a number of the leading varieties of barley and their average yield on this Farm for the last five years.

Six-rowed.

Variety.	Average Days Maturing.	AverageY ield per Acre.	
		Bush.	Lbs.
Odessa..	88	63	47
Mensury	87	63	36
Yale	88	63	10
Mansfield	88	62	30

Two-rowed.

Variety	Average Days Maturing	Bush.	Lbs.
Jarvis..	89	59	34
Standwell..	91	59	33
Swedish Chevalier	93	57	40
Canadian Thorpe..	90	58	18

FIELD CROPS OF BARLEY, 1909.

Variety.	Previous crop.	Number of acres.	Yield per acre.		Total yield.
			Bush.	Lbs.	Bush.
Mensury	Fallow (spring ploughed for couch grass)	12·02	52	29	642
"	Fallow	4·35	57	23	250
"	"	2·7	45	44	124
Odessa	Barley (spring ploughed)	5·00	36	29	183
Mensury	" "	4·33	42	45	186
		Total			1,385

EXPERIMENTS WITH FIELD PEAS.

The pea crop is not grown as extensively in Manitoba as its value warrants. It is probably the most valuable annual leguminous crop that we can grow. Like the other legumes, it is able to utilize the nitrogen of the air in its growth and stores considerable of it in its roots. This goes to enrich the land when the crop is removed. It is a rank-growing crop and might be used to advantage in this province as a green crop to plough down to increase the humus of the soil, as clover does not attain sufficient size in one season here to make it valuable for that purpose. Peas will produce an immense growth in from eight to ten weeks and analyses prove that the growth contains about 130 pounds of nitrogen per acre. A considerable proportion of this is undoubtedly obtained from the atmosphere.

The pea crop is also valuable when ripened. The grain is very rich in protein and when mixed with other grains, is a very valuable feed for milch cows and hogs. The straw is excellent for sheep-feed, if cut before thoroughly ripe.

When being grown for feed, peas are best sown mixed with oats at the rate of three bushels per acre, equal parts by weight. They may then be cut with the binder. This mixture also makes an excellent soiling crop for milch cows for the early part of the summer.

When grown alone, they are best harvested with the pea-harvester attachment to the mower.

FIELD PEAS—TEST OF VARIETIES.

Sixteen varieties were grown under uniform conditions on plots of one-twentieth of an acre each. The land was a clay loam that had been fallowed in 1908. The seed was sown May 8 at the rate of from two to three bushels per acre, depending on the size of the pea.

PEAS—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Length of Straw.	Length of pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					Inches.	In.		Bush.	Lbs.	Lbs.
1	Mackay	Aug. 27	111	Medium	49	2¼	Medium	46	45	63½
2	Prince	" 30	114	"	46	2¼	"	44	15	64
3	Gregory	" 28	112	Rank	55	2½	Large	40	45	65
4	Golden Vine	Sept. 1	116	"	56	2	Small	40	25	65¼
5	Chancellor	Aug. 26	110	Medium	52	2	"	40	25	65
6	English Grey	Sept. 1	116	"	50	2½	Medium	39	5	63¾
7	Victoria	" 3	118	Very rank	63	2½	"	39	5	64
8	Paragon	Aug. 29	113	Rank	56	2½	"	38	45	63
9	Wisconsin Blue	" 28	112	Medium	50	2¼	Small	38	25	65
10	Arthur	" 30	114	"	48	2½	Medium	37	25	64
11	Black-eye Marrowfat	Sept. 7	122	Very rank	66	2½	Large	37	25	63½
12	Early Britain	Aug. 31	115	Medium	49	2¼	"	37	5	62
13	Prussian Blue	" 27	111	"	48	2½	Medium	35	45	63
14	Daniel O'Rourke	" 31	115	Rank	58	2	Small	34	5	64½
15	Picton	" 29	113	Medium	49	2¼	"	33	5	64½
16	White Marrowfat	Sept. 6	121	Very rank	69	2½	Large	32	5	63½

FIELD CROP OF PEAS.

Variety.	Number of acres.	Preparation of land.	Yield per acre.		Total yield.
			Bush.	Lbs.	Bush.
Golden Vine	4·17	Fallow	35	44	149
Arthur	3·58	"	33	14	119
Daniel O'Rourke	4·71	"	26	45	126

MIXTURES OF GRAIN FOR GRAIN PRODUCTION.

An experiment was started this year to get some information on the relative values of mixtures of various grains in different proportions for the production of grain for feed as compared with oats, barley and peas sown alone. There is more and more grain being grown for feed every year, and in this, as in grain-growing for other purposes, the aim should be at the highest possible production per acre. If a mixture of two or three kinds of grain will produce more per acre than any of these grains sown singly, it is worth knowing and worth putting into practice.

The following table gives the yields from the various mixtures.

MIXTURES OF GRAIN.

Oats, 1 bu.; barley, 1 bu.	3,840
" 1 " 1½	3,400
" 1½ " ½	3,380
" ½ " 1½	3,320
" 1 " 1 peas, 1 bu.	3,280
" 1½ " 1½	3,200
" 2 ; peas, ½	3,200
" 1½ " ½	3,020

Oats, ½ bu.; barley, 1 bu.	2,400
" ½ " " 2	2,120
Banner oats	3,760
Daubeney oats	2,360
Mensury barley	2,362
Arthur peas	2,245

Daubeney oats and Mensury barley were used in the mixture of oats and barley, as these varieties ripen at nearly the same time. Arthur peas and Banner oats were used for the other mixtures.

ROTATION EXPERIMENTS.

In 1899, some experiments were started to test the feasibility of eliminating the bare summer-fallow from the system of farming in this province by substituting the ploughing down of some green leguminous crop every third year. On account of the land where these tests were in progress being repeatedly flooded, the work of the first three years was lost and these trials were started again in 1905 on another part of the Farm.

The system of rotation followed is given in the following tables, also the yields and other particulars of the crop produced in 1909:—

ROTATION TEST.

Number.	1907.	1908.	1909.
1	Wheat.	Peas.	Wheat.
2	Oats.	Tares.	"
3	Wheat.	Red Clover.	"
4	Barley.	Alfalfa and Alsike.	"
5	Peas.	Wheat.	"
6	Tares.	"	Oats.
7	Red Clover.	"	Wheat.
8	Alfalfa and Alsike.	"	Barley.
9	Wheat.	"	Peas.
10	"	Oats.	Tares.
11	"	Wheat.	Red Clover.
12	"	Barley.	Alfalfa and Alsike.
13	Summer-fallow.	Wheat.	Wheat.
14	"	"	Oats.
15	"	"	Barley.
16	Oats.	"	Wheat.
17	"	"	Barley.

ROTATION TEST.—RESULTS IN 1909

No. of Plot.	Name of Variety.	Date of sowing.	Date of ripening.	Days maturing.	Length of straw.	Yield per acre.	
					In.	Bush.	Lbs.
1	Red Fife	May 7	Aug. 14	99	38	33	15
2	"	" 7	" 14	99	37	28	35
3	"	" 7	" 16	101	40	36	10
4	"	" 7	" 16	101	41	39	10
5	"	" 7	" 16	101	40	32	50
6	Banner	" 13	" 16	101	43	69	24
7	Red Fife	" 7	" 17	102	40	29	40
8	Mensury	" 17	" 19	104	37	28	46
9	Peas*						
10	Tares*						
11	Red Clover*						
12	Alfalfa and Alsike*						
13	Red Fife	May 7	Aug. 17	102	42	30	20
14	Banner	" 13	" 15	100	39	54	4
15	Mensury	" 17	" 19	104	42	25	20
16	Red Fife	" 7	" 16	101	36	25	10
17	Mensury	" 17	" 20	105	38	29	38

* Ploughed under in May.

SUMMARY OF RESULTS OBTAINED FROM EXPERIMENTS IN CROP ROTATION AT BRANDON, MANITOBA, 1905-1909.

As rotation work in connection with field crops is now being introduced at the Brandon Farm on a much larger scale, it is not thought necessary to continue experiments on the smaller plots.

The work on the latter has, therefore, been summarized in the following tables and a short account of the method of conducting the experiments is given.

In the spring of 1899, arrangements were made for a series of rotation plots, the principal object being the maintaining of the fertility of the soil by the ploughing under of a leguminous crop every third year in place of the usual summer-fallow.

As the first field selected was flooded in 1902 and 1904, it was found unsuitable and a new location was selected in 1905.

The size of plot used was one-tenth acre. The Red Clover was sown at the rate of 12 pounds per acre and mixed clovers in the proportion of 8 pounds of Alfalfa and 6 pounds of Alsike per acre. These leguminous crops were ploughed under when they reached their fullest development.

Plots 13, 14, 15 give tests of grain growing with summer-fallow every third year instead of a leguminous crop and 16 and 17 of growing a grain crop every year.

The order of rotation was as follows:—

	1905.	1906.	1907.
1.	Peas	Wheat	Wheat.
2.	Tares	Wheat	Oats.
3.	Red Clover	Wheat	Wheat.
4.	Alfalfa and alsike	Wheat	Barley.
5.	Wheat	Wheat	Peas.
6.	Wheat	Oats	Tares.
7.	Wheat	Wheat	Red Clover.
8.	Wheat	Barley	Alfalfa and Alsike.
9.	Wheat	Peas	Wheat.

	1905	1906.	1907.
10.	Oats	Tares	Wheat.
11.	Wheat	Red Clover	Wheat.
12.	Barley	Alfalfa and Alsike	Wheat.
13.	Wheat	Wheat	Summer-fallow.
14.	Wheat	Oats	Summer-fallow.
15.	Wheat	Barley	Summer-fallow.
16.	Wheat	Wheat	Oats.
17.	Wheat	Barley	Oats.

The average and total yield of each variety of grain on each plot has been worked out for the number of years each has been sown and the revenue from each plot for the five year period from 1905 to 1909, inclusive, found; wheat has been valued at 90c. per bushel, oats at 40c. and barley at 50c. per bushel.

No. of Plot.	Variety Grown.	1905.		1906.		1907.		1908.		1909.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
	Peas	Peas.						Peas.			
	Wheat			33	30					33	15
1	Wheat					29	—				
	Tares	Tares						Tares.			
	Wheat			33	30					28	35
2	Oats					56	6				
	Red Clover	Clover.						Clover.			
	Wheat			30	40					36	10
3	Wheat					30	20				
	Alfalfa and Alsike	Alf. & Alsike.						Alf. & Alsike.			
	Wheat			30	10					39	10
4	Barley					39	18				
	Wheat	35	50					33	25		
	Wheat			30	10					32	50
5	Peas					Peas.					
	Wheat	36	20					32	55		
	Oats			102	22					69	24
6	Tares					Tares.					
	Wheat	35	00					33	5		
	Wheat			27	50					29	40
7	Red Clover					Red Clover					
	Wheat	33	00					34	30		
	Barley			52	04					28	46
8	Alfalfa and Alsike					Alfal. & Alsike					
	Wheat	33	30					27	10		
	Peas			Peas.						Peas.	
9	Wheat					30	40				
	Oats	105	00					57	22		
	Tares			Tares.						Tares.	
10	Wheat					37	10				
	Wheat	35	20					24	15		
	Red Clover			Red Clover						Red Clover.	
11	Wheat					42	10				
	Barley	40	10					41	42		
	Alfalfa and Alsike			Alf. & Alsike.						Alf. & Alsike	
12	Wheat					41	20				
	Wheat	35	40					35	35		
	Wheat			28	50					30	20

No. of Plot.	Variety Grown.	1905.		1906.		1907.		1908.		1909.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
13	Summer-fallow..........	.....	.....	....	....	Summ'r-fallow		....	.....		
	Wheat..............	35	10	.....	......	....		35	45		
	Oats ..	....		85	00	....		....			
14	Summer-fallow..........	....		....		Summ'r-fallow		....		54	4
	Wheat...	38	10	....	..	....		36	25		
	Barley	....		46	22	....		....		25	20
15	Summer-fallow	....		.....	.....	Summ'r-fallow		....			
	Wheat..................	35	10	....		.....	....	23	55		
	Wheat	....		28	40	....		....		25	10
16	Oats.................	.....	......	....	...	105	00	....			
	Wheat....	35	50	....		....	....	24	15		
	Barley..............	.....	....	46	12	....		....	....	29	38
17	Oats.......	.....	....	.....	......	95	30	....	....		

No. of Plot.	Variety.	Average yield per acre.		Total yield per acre.		Total revenue per acre.		Total revenue per plot.	
		Bush.	Lbs.	Bush.	Lbs.	$	cts.	$	cts.
	Wheat 2 years }	31	55	95	45	86	17	8	62
	" 1 year }								
1	Peas 2 years	....	.....	....		....		ploughed under.	
	Wheat 2 years	31	02	62	05	55	88		
	Oats 1 year	56	06	56	06	22	47	7	84
						78	35		
2	Tares 2 years	....	..	....	....	.....	......	ploughed under.	
	Wheat 2 years }	32	23	97	10	87	45	8	75
	" 1 year }								
3	Red Clover 2 years	......	... .	....		....		ploughed under.	
	Wheat 2 years	34	40	69	20	62	40		
	Barley 1 year	39	18	39	18	19	69	8	21
						82	09		
4	Alfalfa and Alsike 2 years	....		...	....	....		ploughed under.	
	Wheat 2 years }	33	04	132	15	119	02	11	90
	" 2 " }								
5	Peas 1 year	....		....		......	...	ploughed under.	
	Wheat 2 years	34	37	69	15	62	32		
	Oats 2 years	86	06	172	12	68	94	13	13
						131	26		
6	Tares 1 year	......	.....	.....	....	....		ploughed under.	
	Wheat 2 years }	31	24	125	35	113	02	11	30
	" 2 " }								
7	Red Clover 1 year	....		....		....	...	ploughed under.	
	Wheat 2 years	33	45	67	30	60	75		
	Barley 2 "	40	25	81	02	40	52	10	13
						101	27		
8	Alfalfa and Alsike 1 year	....		....		....		ploughed under.	

No. of Plot.	Variety.	Average yield per acre.		Total yield per acre.		Total revenue per acre.	Total revenue per plot.
		Bush.	Lbs.	Bush.	Lbs.	$ cts.	$ cts.
	Wheat 2 years } " 1 year	33	27	100	20	90 30	9 03
9	Peas 2 years						ploughed under.
	Oats 2 years	81	11	162	22	65 06	
	Wheat 1 year	37	10	37	10	33 45	9 85
						98 51	
10	Tares 2 years						ploughed under.
	Wheat 2 years } " 1 year	33	55	101	45	91 56	9 16
11	Red Clover 1 year						ploughed under.
	Barley 2 years	41	02	82	04	41 05	
	Wheat 1 year	41	20	41	20	37 20	7 83
						78 25	
12	Alfalfa and Alsike 2 years						ploughed under.
	Wheat 2 years } " 2 "	32	36	130	25	117 37	11 74
13	Summer-fallow 1 year						
	Wheat 2 years	35	27	70	55	63 82	
	Oats 2 years	69	19	139	04	51 65	11 94
						19 47	
14	Summer-fallow 1 year						
	Wheat 2 years	37	17	74	35	67 12	
	Barley 2 "	35	45	71	42	35 93	10 30
						103 05	
15	Summer-fallow 1 year						
	Wheat 2 years	28	14	112	55	101 62	
	Wheat 2 "	105	—	105	00	42 00	14 36
						143 62	
16	Oats 1 year						
	Wheat 2 years	30	02	60	05	54 08	
	Barley 2 "	38	01	76	02	38 02	
17	Oats 1 year	95	30	95	30	38 35	13 04
						130 45	

CORN AS A FODDER CROP FOR WESTERN CANADA

Corn is one of the crops that, if better known, would be grown much more generally in Western Canada than it is. It is not a new crop but has been on trial for a great many years and has amply proven its worth. Its warmest advocates do not claim that it can be matured as successfully as it can further south, but those who have given it a fair trial will agree that it grows luxuriantly under our climatic and soil conditions and produces more good fodder per acre than any other crop we can grow. More than this, it responds to good treatment to an extent equalled by few other crops by giving a liberal return for manure applied and for cultivation through the growing season. The cultivation also aids materially in clearing the land of weeds and in preparing it for the next crop. If corn were more generally grown, the

solution of the weed question would be simplified and a stimulus given to more thorough farming.

Corn will thrive on any fertile, well-drained soil. A warm soil with a southern slope is preferred by some growers, but, although this may be an advantage, it is not necessary. To secure the most favourable conditions, I would recommend the ploughing of a field of sod in late summer after applying manure at the rate of about 16 tons per acre. The more the land can be worked before winter the better, and in the following spring it can do with little attention until after seeding though an occasional harrowing to kill weeds and check evaporation should be given. But to secure a good crop, a sod is not necessary. Stubble may be ploughed either in fall or in spring after the application of manure and worked down into good condition by the twentieth of May. The manuring should not be neglected, as no other crop on the farm will make better use of manure than will corn.

It is not advisable, in this latitude, to sow the larger late varieties, as they are so far from maturity when the season for cutting arrives that they are deficient in quality. The earlier varieties do not produce as great a bulk of feed per acre but it is of very much better quality. For two years we have grown Northwestern Dent for the bulk of our field corn and have found it very satisfactory. It grows from seven to nine feet high and, when planted about May 24, is ready for cutting by September 1 Longfellow, Compton's Early and North Dakota White are other good varieties, all somewhat larger growing, but considerably later, than Northwestern Dent. Mercer and Triumph are two other sorts that promise well.

It is not usually safe to sow before the twentieth of May but seeding should not be delayed after that date. Since corn planters are not likely to be in general use here for some time yet, the grain drill can be used. A sufficient number of spouts should be plugged up so that the drills will be from three to three and a half feet apart. The latter distance allows the cultivator to be used to better advantage. A common mistake is made in sowing corn too thickly in the row. About fifteen pounds is sufficient seed for an acre if it is evenly distributed, when the rows are three and a half feet apart. The stalks should not be closer together in the row than eight inches or there will be very few cobs formed. If it comes up any thicker than this it should be harrowed out.

The advice is sometimes given to sow corn on the weediest land as it is an excellent crop to clean land. That depends on the cultivation. If the crop is cultivated as it should be, it is a good land cleaner, but if it is not cultivated it is little better than any other grain crop. This work should start as soon as the corn is planted, and in its early stages should consist in running the harrow over the land every few days until the corn is six inches high. A few stalks will be rooted up but so also will myriads of weeds which are just starting to grow. The harrow is the cheapest weed destroyer we have if it is used at the proper time. After the harrows can no longer be used, either the one or the two-horse cultivator should be put to work and used as frequently as the other work will allow, or sufficiently often to keep weeds in check, and the soil stirred to a depth of two inches. Cultivation should not be deep at any time and should get shallower as the season advances. This may seem like a lot of cultivating, but, if one can keep the next year's crop in mind when doing the work, he will not think the time and labour spent such a loss. Besides destroying the weeds, the cultivation greatly stimulates the growth of the crop.

The most satisfactory method of harvesting the crop is by means of the corn binder which cuts a row at a time and binds it in sheaves. When several farmers in a district are growing corn, it is well worth while getting one of these machines. When a corn binder is not available, it is usually advisable to cut by hand, as the ordinary grain binder is far from satisfactory.

The ideal way to handle fodder corn after it is cut is by means of the silo as it is stored without loss and is available for feeding whenever required. There are few silos in use in Western Canada, but, as corn is grown in larger areas, they will

surely be more common, as they have been found to be a decided success in this climate wherever they have been given a fair trial.

When corn is to be fed as a dry fodder, it has to be cured by stooking as soon as cut. From 500 pounds to half a ton of corn may be put in one shock, tied firmly near the top with binder twine to prevent its blowing over. It may be drawn to the barn as required for feed during the winter and fed either whole or after being run through a cutting-box to either horses or cattle.

If the crop of corn has been worked as it should have been throughout the summer, very little work is required to put the land into first-class condition for the following crop. If the weeds have been kept down, there is no object in ploughing the land as this leaves the soil too loose and open on account of the corn roots being turned up. We have found it very satisfactory to sow the next year's grain crop after thoroughly harrowing the land. The corn roots are not disturbed, the soil is firm, and, by the end of the growing season, the roots have all rotted away and give no further trouble. For the past two years, the grain crops that we have harvested from land that was in corn the year previous were more satisfactory than those off summer-fallow.

INDIAN CORN—TEST OF VARIETIES.

Twenty varieties of Indian corn were grown under uniform conditions in 1909. The land, a clay loam, had been in corn the year before and was manured at the rate of 16 tons per acre and ploughed in the fall of 1908. The season of 1909 was an excellent one for corn, being unusually warm, and all varieties made excellent growth. Unfortunately, we had a slight frost on August 29 which withered the leaves. This reduced the weight somewhat but was not sufficient to seriously injure the quality. The corn was sown on June 7 and harvested on September 6. The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

INDIAN CORN—Test of Varieties.

No. of Plot.	Name of Variety.	Character of growth.	Height.	Leafiness.	Condition when cut.	Weight per acre grown in rows.	
			Inches.			Tons.	Lbs.
1	Superior Fodder	Very rank	98	Fairly	Tassel	16	76
2	North Dakota White	Rank	100	"	Late milk	14	1,898
3	Mercer	Medium	91	"	Early "	14	710
4	Compton's Early	Rank	102	"	" "	14	116
5	Angel of Midnight	"	95	Very	Silk	13	1,720
6	Early Mastodon	Very rank	109	Fairly	Tassel	13	532
7	Mammoth Cuban	"	106	"	Early milk	13	532
8	White Cap Yellow Dent	"	113	"	" "	12	1.938
9	Eureka	"	109	"	Silk	12	552
10	Salzer's All Gold	"	105	"	Ta sel	11	1.562
11	Champion White Pearl	"	114	"	"	11	1,562
12	Wood's Northern Dent	"	111	Very	Silk	11	968
13	Longfellow	"	110	"	"	11	968
14	Selected Leaming	"	110	Fairly	"	11	968
15	Northwestern Dent	Medium	94	"	Early dough	10	790
16	Golden Dent	"	86	"	" "	9	1,998
17	No. 23 Minnesota	"	92	"	" "	9	1,998
18	Triumph	"	78	"	Late milk	9	1,404
19	Davidson	"	83	"	Early dough	6	1,266
20	Paterson No. 1	Small, scrubby	66	"	Firm dough	5	890

INDIAN CORN—Test of Seeding at Different Distances.

Variety.	Distance apart.	Height.	Yield per acre.
	Inches.	Inches.	Tons. Lbs.
Longfellow	24	94	10 1,780
"	30	102	11 704
"	36	104	12 640
"	42	100	11 1,751
Selected Leaming	24	97	15 1,350
"	30	103	15 1,416
"	36	115	12 1,080
"	42	112	14 275
Champion White Pearl	24	100	14 1,040
" "	30	101	11 1,496
" "	36	99	12 1,740
" "	42	106	11 808½
Longfellow (Hill)	....	110	10 1,978
Selected Leaming (Hill)	....	115	11 770
Champion White Pearl (Hill)	....	106	13 1,522

INDIAN CORN—Test of Seeding at Different Distances.—Average of 11 Years ending 1909.

Variety.	Distance apart.	Yield per acre.
	Inches.	Tons. Lbs.
Selected Leaming	24	19 1,563
"	30	19 1,232
"	36	18 1,728
"	42	17 525
Champion White Pearl	24	21 948
" "	30	20 540
" "	36	18 1,893
" "	42	17 1,893
Longfellow	24	17 820
"	30	18 1,250
"	36	19 259
"	42	18 566

AVERAGE of Three Varieties for Eleven Years.

Variety.	Distance apart.	Yield per acre.
	Inches.	Tons. Lbs.
Selected Leaming	24	19 1,110
Champion White Pearl	30	19 1,007
Longfellow	36	18 1,960
"	42	17 1,661

The highest average yield for eleven years is from sowing in rows 24 inches apart, but there is very little difference between this and 30 inches apart. In order to cultivate the corn properly, should cleaning the land be an object in view, it must be

sown at least 36 inches apart, and better work can usually be done when the rows are even wider apart. This is more particularly true when the larger kinds are grown.

EXPERIMENTS WITH FIELD ROOTS.

Field roots are not largely grown in Manitoba, but the acreage is gradually increasing from year to year. The long winter makes the use of some such feed as roots almost essential, if stock are to be kept in thrifty, growing condition. For young cattle and growing pigs they are particularly desirable.

All classes of roots produce abundantly here when given suitable conditions. Turnips will probably continue to be the most satisfactory, as they are not so easily injured in spring or fall by frost as are mangels or sugar beets. When saved without frost, mangels and sugar beets will keep better than turnips and are more relished by cattle and hogs.

The past season was too warm and dry for the best success with roots, and the crop was somewhat below the average. Two sowings of each variety were again made this year, the first sowing giving the better results.

Sowing on the flat was practised, as the land does not dry out to the same extent as when it is drilled up. The rows were 30 inches apart, and the young plants were thinned out to about 9 inches apart in the row.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown on clay loam that had been in potatoes the previous year. The first sowing was made on May 5 and the second on May 19, both lots being pulled October 16. The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

TURNIPS.—Test of Varieties.

Number of Plot.	Number of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Bangholm Selected	23	1,256	787	36	12	1,872	431	12
2	Hall's Westbury	23	992	783	12	17	1,376	589	36
3	Halewood's Bronze Top	21	504	708	24	16	1,000	550	..
4	Good Luck	20	392	673	12	12	24	400	24
5	Jumbo	19	1,860	664	20	12	552	409	12
6	Magnum Bonum	19	1,072	651	12	15	1,680	528	..
7	Mammoth Clyde	19	1,072	651	12	14	1,832	497	12
8	Carter's Elephant	19	544	642	24	13	928	448	48
9	Kangaroo	17	56	567	36	13	136	435	33
10	Perfection Swede	16	1,792	563	12	16	1,528	558	48
11	Skirving's	12	1,608	426	48	21	576	809	36
12	Hartley's Bronze	12	552	409	12	17	320	572	..

EXPERIMENTS WITH MANGELS.

Eleven varieties of mangels were sown under uniform conditions. The land was a clay loam that had been in potatoes the year previous.

The first sowing was made on May 13 and the second on May 27. Both lots were pulled September 29. The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

MANGELS.—Test of Varieties.

No. of Plot.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Gate Post	35	1,280	1,188	..	17	1,904	598	24
2	Half Sugar White	31	1,096	1,051	36	33	264	1,104	24
3	Perfection Mammoth Long Red	25	1,480	858	..	24	576	809	36
4	Prize Mammoth Long Red	25	1,216	853	36	19	1,864	664	24
5	Giant Yellow Globe	24	840	814	..	16	208	536	04
6	Yellow Intermediate	23	728	778	48	14	512	475	12
7	Giant Sugar White	21	1,560	726	..	31	832	1,047	12
8	Giant Yellow Intermediate	19	1,072	651	12	20	392	673	12
9	Selected Yellow Globe	18	1,848	624	48	15	1,944	532	24
10	Crimson Champion	18	696	611	36	3	72	101	12
11	Mammoth Red Intermediate	13	400	440	...	13	1,720	462	..

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown this year under uniform conditions. The land was a clay loam that had been in potatoes in 1908. The carrots were sown in rows 18 inches apart, and the plants thinned out to about four inches apart in the row.

The first sowing was made May 5 and the second May 19. Both lots were pulled October 16. The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

CARROTS.—Test of Varieties.

No. of Plot.	Name of Variety.	Yield per Acre.—1st Plot. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
1	Ontario Champion	22	1,320	755	20	17	320	572	..
2	Mammoth White Intermediate	20	40	667	20	15	360	506	..
3	White Belgian	19	280	638	..	13	400	440	..
4	Half-Long Chantenay	18	1,840	630	40	15	1,240	520	49
5	Improved Short White	15	1,240	520	40	17	760	579	20

EXPERIMENTS WITH SUGAR BEETS.

As there are no sugar factories in Manitoba, sugar beets are grown for stock feeding only. Being richer in sugar than are other roots, they are greatly relished by all kinds of stock, hogs being particularly partial to them.

Samples of the three varieties grown here were forwarded to Mr. Frank T. Shutt, Chemist of the Dominion Experimental Farms, for analysis and the results are given herewith.

The percentage of 'Sugar in Juice' is higher than usual. The beets were slightly withered after being pulled and this, no doubt, is partly the reason for such unusually high figures.

The first sowing was made May 13 and the second May 27. Both lots were pulled September 29. The yield per acre was estimated from the product of two rows, each 66 feet long.

SUGAR BEETS.—TEST OF VARIETIES.

YIELD PER ACRE.

No. of Plot.	Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs	2nd Plot. Tons.	Lbs.	Bush.	Lbs	Sugar in Juice. p. c.	Solids in Juice.	Co-efficient of Purity.
1	Klein Wanzleben...	20	1,976	699	36	14	512	457	12	17·33	21·17	81·8
2	Vilmorin's Improved	19	1,336	655	36	14	248	470	48	17·89	22·37	79·9
3	French Very Rich..	13	1,192	453	12	9	1,272	321	12	21·27	24·76	85·8

EXPERIMENTS WITH POTATOES.

Potatoes were only a fair crop in this district in 1909, as the season was too dry. The land on the Experimental Farm, a clay loam, was in good condition and a good average yield was secured. Potato beetles made their appearance as usual but were controlled by the use of Paris green.

Twenty-four varieties were grown this year. They were planted on May 25, in rows three feet apart, with sets about a foot apart in the row. They were dug October 1. No rot was observed.

The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

POTATOES.—Test of Varieties.

No. of Plot.	Name of Variety.	Character of growth.	Average size.	Total yield per acre. Bush.	Lbs.	Yield per acre of market-able. Bush.	Lbs.	Yield per acre of unmarket-able. Bush.	Lbs.	Form and colour.
1	Ashleaf Kidney.....	Rank.....	Very large......	476	40	443	40	33	..	Long, white.
2	American Wonder..	"	"	421	40	407	..	14	40	Long, round, white
3	Morgan Seedling....	Fair......	Large	419	50	390	30	29	20	" pink.
4	Manitoba Wonder ..	"	"	412	30	379	30	33	..	" red.
5	Early White Prize..	"	Small to medium	403	20	355	40	47	40	White, oval.
6	Money Maker	Rank	Medium........	401	30	374	..	27	30	Round, oval, white.
7	State of Maine......	"	Large	392	20	348	20	44	..	" white.
8	Rochester Rose......	Fair	Small	366	40	304	20	62	20	Long, pink.
9	Holborn Abundance.	Very rank	Large	341	..	306	10	34	50	Round, white.
10	Irish Cobbler........	Fair.....	Small to medium	337	20	293	20	44	..	" "
11	Reeve's Rose... . . .	"	Medium.... ..	331	50	306	10	25	40	Flat, light pink.
12	Late Puritan	Rank.....	Large	330	..	313	30	16	30	Long, white.
13	Dreer's Standard....	"	Medium........	315	20	286	..	29	20	Flattish, oval, white
14	Dooley.............	"	Large	311	40	275	..	36	40	Round, white.
15	Everett	Fair......	Medium........	308	..	271	20	36	40	Long, pink.
16	Carman No. 1.....	"	Large	308	.	271	20	36	40	Flat, white.
17	Gold Coin..........	Very rank	"	306	10	265	50	40	20	Round, white.
18	MacQueen..........	Fair......	"	302	30	278	40	23	50	Long, round, white.
19	Collin's Seedling....	Rank.....	Small........ ..	293	20	232	50	60	30	Round, white.
20	Vick's Extra Early .	"	Small to medium	291	30	242	..	49	30	Flat, pink.
21	Empire State	"	Medium.... ...	282	20	264	..	18	20	Long, white.
22	Henderson's Russet Seedling	Fair......	Small	275	..	183	20	91	40	Long.
23	Uncle Gideon's Quick Lunch	"	"	243	50	216	20	27	30	Round, light pink.
24	Dalmeny Beauty....	Weak	"	179	40	139	20	40	20	Oval, white.

Varieties for early use that can be recommended are Everett, Bovee, Early White Prize, and for general crop; Dreer's Standard, Uncle Sam, Carman No. 1, Money Maker and American Wonder.

EXPERIMENTS WITH GRASSES AND CLOVERS.

It is pleasing to note a greater interest being taken every year in the culture of grasses and clovers throughout Manitoba. This is partly accounted for by the growing scarcity of wild lands from which hay may be cut, but is largely due to the growing appreciation of the fact that the farm lands of this province are in need of different treatment to that which they received when they were in virgin condition. Even the best land that has been under cultivation for fifteen to twenty years, growing cereal crops mainly, shows the need of grasses and clovers to add root-fibre and humus.

The general interest in mixed farming is leading many to experiment on a small scale with different kinds of grasses and clovers. It is recognized that the cultivation of these crops becomes essential where a higher system of agriculture is practised, and a wise course is pursued in gradually becoming accustomed to growing them.

In view of the great interest in the growing of these crops in Manitoba at the present time, a summary of the results that have been secured on this Farm and in other parts of the west, is herewith presented.

Alfalfa.

Alfalfa has been on trial at the Experimental Farm for upwards of fifteen years and has been grown to a limited extent in other parts of Manitoba. During these trials, failures have been met with and difficulties encountered, but of late years very good success has been had. There has not been sufficient experimental work done throughout the province to warrant us in recommending every farmer to grow alfalfa extensively, but such excellent crops have been secured here and at other points in Manitoba that we are warranted in suggesting that every farmer give it a trial. If the excellent qualities of the plant as a forage crop were known, with the conditions necessary to its successful cultivation, it would undoubtedly be grown much more extensively.

Alfalfa requires a well-drained soil and will not thrive on land where water lies at any time of the year. Sandy loam with a porous subsoil is usually considered ideal but the nature of the surface soil is of comparatively little importance. The most essential requisite in soil is that the water level be not closer than three feet to the surface.

The preparation of the soil is also important. Land in good condition that has been cropped for several years is preferable to new land. One of the best preparations is a crop of potatoes or roots, or summer-fallow is quite suitable. The important features are, that the land be fairly clean and quite free from grass, and in at least a fair state of fertility. Good catches have been secured on stubble land ploughed either in the spring or fall and well top-worked, but potato land or summer-fallow is to be preferred.

Alfalfa, like all other legumes, is able to utilize the nitrogen of the air in its growth and to this is largely due its value as a soil renovator and as a fodder. This important function is performed through the medium of bacteria which find lodgment in the roots of the plants. Their presence is indicated by the formation of small nodules or excrescences on the roots about the size of a pin head. These frequently appear in bunches and are usually found on the younger parts of the roots. The absence of these nodules is an indication that the soil does not contain the bacteria. The alfalfa will live for the first season at least without these bacteria being present, but it lacks stamina and vigour and is apt to succumb during the first winter.

Our prairie soils sometimes have these bacteria present naturally, but otherwise it is necessary to inoculate. This can most readily be done by securing soil from a field where alfalfa has been growing successfully and scattering it over the land at the rate of from 100 to 200 pounds per acre. This may be done to advantage before sowing the seed, but it may, if necessary, be distributed after the alfalfa is growing as it will gradually be washed in with the rain.

It is not always necessary to inoculate the land but it is always advisable, as the chances of success are thereby increased. The Experimental Farm will furnish 100 pounds of inoculated soil free to farmers in Manitoba who apply for it. The applicant will have to pay the freight from Brandon.

Several strains of seed have been under trial but up to the present there has been very little difference in hardiness shown. Turkestan alfalfa is generally considered somewhat hardier than the common alfalfa but it is not always so. Grimm's alfalfa, a strain grown in Minnesota for some years, has been found somewhat hardier than any other strain tested at the Experimental Farm, Indian Head, Sask. A plot of Grimm's alfalfa, sown at Brandon in the spring of 1908, has given good returns and has not winter-killed but neither has any of the other strains sown at the same time.

The seed may be sown any time after the middle of May until the first of July. A nurse crop of grain should never be used in this climate, as alfalfa sown with a nurse crop has always been a failure. Ffteen to twenty pounds of seed per acre is sufficient.

For several years we have sown our alfalfa with the ordinary grain drill. The seed is mixed with about twice the quantity of coarsely chopped barley or wheat to regulate the feed. The seed can be sown at a uniform depth by this method and is much better covered than when sown broadcast.

The plants should be clipped once or twice during the first season. This keeps weeds from seeding and makes the young plants root better. The cuttings may be allowed to lie on the ground unless they are very heavy. The last clipping should not be later than August 15, as the alfalfa should go into the winter with a good top. The alfalfa should not on any account be pastured the first season, and, if pastured afterwards, should never be eaten closely.

Much of the value of alfalfa hay depends upon the curing. After it starts to bloom, the stalks rapidly become hard and woody and lose their feeding value. It should, therefore, be cut as soon as it commences to bloom, or, as it is sometimes said, when it is one-tenth in bloom. The most nutritious part of the plant is the leaves and, to save the leaves, the curing must be done in the cock. It should be raked into windrows soon after cutting and at once put into small cocks to cure. In this way, the leaves are all retained on the stalks and the hay has not lost any of its nourishing qualities. It is usually an advantage to upset the cocks an hour or two before stacking or drawing to the barn, to air the part that has been next the ground. Two cuttings are usually all that can be secured in Manitoba in a season. The last cutting should not be made later than the middle of August to enable the plants to make some growth before winter.

To those who contemplate growing alfalfa, I would suggest that it be tried first on a small scale, not more than one or two acres. When a small area becomes established, it will furnish soil to inoculate as much land as it is desired to sow.

Several different strains of alfalfa are growing at present on the Experimental Farm. These were sown in 1907 and 1908. There has been practically no winter-killing up to the present. The mixtures of alfalfa with rye grass and Timothy yield a crop of mixed hay at the first cutting and a crop of pure Alfalfa at the second cutting.

The following table gives the yield of cured hay per acre from the alfalfa plots in 1909. Most of the plots are of one-fifth of an acre each.

ALFALFA AND ALFALFA MIXTURES.

Name.	Date of sowing.	Yield per Acre.					
		1st cutting.		2nd cutting.		Total.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Alfalfa (Indian Head Seed)........	1907	2	300	1	1,800	4	100
Alfalfa........	"	1	1,800	1	1,250	3	1,050
Grimm's Alfalfa................	1908.....	2	800	1	1,725	4	525
Turkestan "	"	2	350	1	1,450	3	1,800
Alfalfa and Timothy.	"	1	1,600	1	1,800	3	1,400
" and Western Rye grass.....	"	1	1,450	1	1,550	3	1,000

RED CLOVER.

Red Clover has been under trial on the Experimental Farm since 1895. In many of the earlier trials, the clover suffered severely from winter-killing, particularly when it was sown with a nurse crop. When sown without a nurse crop, the plants became much stronger by fall and there was less loss during the winter. The first success in sowing with a nurse crop of grain was in 1904. In this trial, half a bushel of barley per acre was sown as a nurse crop and this was cut green for hay and removed at once from the land. The clover made good growth and came through the winter safely. For several years past, excellent results have attended the growing of Red Clover both with and without a nurse crop.

Unlike alfalfa, Red Clover is a short-lived plant. It usually lives for two years only but under favourable conditions, will sometimes persist longer. It is usually sown mixed with some grass such as Timothy and Western Rye Grass, and two crops of hay taken. The first crop will be mainly clover, the second mainly grass.

It is impossible to state definitely why Red Clover has succeeded so much better during the past three or four years than formerly. The seasons have not been particularly propitious nor has the culture been markedly different. It is probably largely due to the land becoming thoroughly inoculated with the bacteria that thrive on the clover roots. The bacteria are closely allied to those that live in contact with the roots of alfalfa and the function they perform is similar. When they are not present, the plants lack in vigour and stamina. Occasional clover plants that have nodules on the roots will be found in a field which has not been inoculated, and when the majority of the plants are from three to six inches high those inoculated are from twelve to fifteen inches high and of a darker, richer green colour. The bacteria will gradually spread where they are present in a field but the safer and quicker plan is to inoculate the land at the time the seed is sown. This can most readily be done by the application of soil from a field where Red Clover has been grown successfully.

Various nurse crops have been tried and, up to the present, oats have been found most satisfactory. They should be sown not thicker than two bushels per acre and the clover and grass seed sown with the grass seeder attachment to the grain drill, or separately with a grass seed grower, and harrowed in.

In 1908, twelve acres was seeded down with a mixture of Red Clover, 8 lbs., and timothy, 4 lbs., per acre, with oats and an excellent stand secured. This field produced about two and a half tons of hay per acre in 1909 and part of the second crop was cut for seed. About twenty acres was seeded to the same mixture in 1909 and, with the exception of two or three acres on light land, was a fairly good catch. The season was quite unfavourable, as we had practically no rain after July and the weather was very hot after the grain was removed.

With Red Clover, as with alfalfa, it is not advisable to pasture during the fall of the year it is sown, as it should have as much top as possible to go into the winter.

The value of clover hay depends largely on its being cut early and cured properly. It should be cut as soon as it is in full bloom or it otherwise becomes too woody. The curing should be done in cocks to save the leaves, the most valuable part of the hay.

The following table gives the yields of hay per acre of a number of different clovers, grasses and mixtures sown in 1907 and 1908. The plots were all one-fifth acre each:—

CLOVERS, GRASSES AND MIXTURES.

Name.	Year Sown.	Yield per Acre. Tons.	Lbs.
Red Clover (*Trifolium pratense*)	1907		1,725
Alsike Clover " *hybridum*)	1907		1,825
Timothy (*Phleum pratense*)	1907		1,870
Western Rye Grass (*Agropyrum tenerum*)	1907	1	575
Western Rye Grass and Red Clover	1907	2	575
Timothy and Red Clover	1907	1	725
Timothy and Alsike	1907		1,000
Orchard Grass (*Dactylis glomerata*)	1908		850

The yield from the Red Clover is low, but it must be remembered that this is the second year in crop. In 1908, the crop from the Red Clover was 3 tons, 800 lbs. per acre.

The difference in yield between the Western Rye Grass and the mixture of Western Rye Grass and Red Clover is noteworthy. The two plots were separated by only a four-foot division and the land was similar in every respect. There was a distinctly darker green to the plot with the clover throughout the season and the yield was nearly double that of the rye grass alone. Not only was there more hay, but the hay was also of better quality and much easier handled. There was also a heavier aftermath.

Orchard grass came through the winter without any winter-killing. It is really a pasture grass so the yield of hay is light. There was an abundant aftermath.

Perennial Rye Grass (*Lolium perenne*) was also sown in 1908 and was a good stand in the fall but was completely killed out in the winter. The conditions were the same as for the other grasses.

SUMMARY OF CROPS, 1909.

	Bush.
Wheat—	
6 varieties, 47·54 acres	1,504
38 uniform test plots	92
	1,596
Oats—	
3 varieties, 53·73 acres	3,302
35 uniform test plots	135
	3,437
Barley—	
2 varieties, 28·58 acres	1,385
29 uniform test plots	112
	1.497

	Bush.
Peas—	
3 varieties, 12·46 acres	394
16 uniform test plots	28
	422
Spring Rye	18
Flax	8
Potatoes	127
Roots	1,866
	Tons.
Fodder Corn	120
Hay—	
Alfalfa	20
Red Clover and Timothy	25
Brome	17
Western Rye Grass	19
Wild Hay	33
	114

CATTLE.

There are at present representatives of two breeds of cattle on the Experimental Farm—Shorthorns and Ayrshires—and a number of grades for feeding experiments.

The cattle on hand at present are:—

Shorthorns—Three bulls and ten females.

Ayrshires—Four bulls and three females.

Grades—Two cows, three heifers and forty steers.

MILK RECORD FOR 1909-10.

Name.	Breed.	No. of days milking.	No. lbs. milk.
Snowball	Ayrshire	328	5,824
Jane	Shorthorn	268	4,423
Daisy	"	136	2,704
Rose	"	324	5,768
Blanche	Grade	276	4,095
Lily	Ayrshire	353	7,943
Buttercup	Grade	93	2,496

STEER FEEDING EXPERIMENTS.

The work that was started in the fall of 1907 in the feeding of steers outside as compared with in the stable has been continued. The cattle secured this year were not of such good quality as those fed a year ago and the results have not been as satisfactory. Smaller gains were made and, although a better price was secured, there was less profit from the feeding operations.

Forty head of steers rising three years, were bought at $3.25 per hundred, and the test commenced on Dec. 7, 1908. They weighed about 150 pounds per head lighter than those fed the year before, averaging only 968 lbs. and a number were of poor conformation. The steers were divided into three lots, four were fed loose in a box stall, sixteen were tied in the stable and twenty were fed outside. No artificial shelter was provided for those fed outside, but there was considerable natural shelter in the form of poplar and oak scrub and coulées. These provided a break for the wind.

The outside lot was fed oat straw for roughage during most of the period, with some hay during the last six weeks. Those in the loose box were fed exactly the same

as those outside. Those tied in the stable were fed silage, a few roots, straw and chopped grain, the same as the year before.

The grain ration was light to begin with, being four lbs. per day, one half bran and one half barley and oat chop. This amount of grain was gradually increased until by the first of April they were receiving twelve lbs. per day. This amount was continued until they were sold on May 10, 1909.

The following prices were charged for feed:—

	Per ton.
Grain..	$20 00
Bran..	18 00
Ground Flax..	30 00
Straw..	1 00
Prairie Hay..	4 00
Alfalfa..	6 00
Ensilage..	2 00
Oat Sheaves..	3 00

TEST OF FEEDING STEERS.

Results.	—
Outside.	
No. of steers in lot	20
First weight, gross	19,635 lbs.
" average	981¾ "
Finished weight, gross	22,020 "
" average	1,101 "
Total gain in 154 days	2,385 "
Average gain per steer	119 "
Daily gain per steer	·77 "
" " lot	15·4 "
Gross cost of feed	$379 04
Cost of 100 pounds gain	15 89
Cost of steers, 19,635 lbs. at 3¼c.	638 14
Total cost to produce beef	1,017 18
Sold, 17,980 lbs. at 5c. less 5 per cent.	854 05
" 4,040 " 4½c. less 5 per cent.	172 71
Profit on lot	9 58
Net profit per steer	47
Average buying price per steer	31 90
" selling " "	51 33
" increase in value	19 43
Average cost of feed per steer	18 95
Amount of grain eaten by lot	23,980 lbs.
" straw "	52,000 "
" hay "	34,000 "
" alfalfa "	4,000 "
" ground flax eaten by lot	140 "
" bran eaten by lot	3,460 "
Inside (Tied).	
No. of steers in lot	16
First weight, gross	15,020 lbs.
" average	938 "
Finished weight, gross	17,975 "
" average	1,124½ "
Total gain in 154 days	2,955 "
Average gain per steer	184 "
Daily gain per steer	1·2 "
" lot	19·2 "
Gross cost of feed	$267 81
Cost of 100 lbs. gain	9 05
Cost of steers, 15,020 lbs. at 3¼ per cent.	488 15
Total cost to produce beef	755 96
Inside (Tied)—*Con.*	
Sold, 16,900 lbs. at 5c. less 5 per cent.	802 75
" 1,075 lbs. at 4½c. less 5 per cent.	45 99
Profit on lot	92 78
Net profit per steer	5 79
Average buying price per steer	30 51
" selling "	53 04
" increase in value	22 53
" cost of feed per steer	16 74
Amount of grain eaten by lot	16,112 lbs.
" straw "	23,468 "
" ensilage "	43,200 "
" roots "	17,088 "
" ground flax eaten by lot	224 "
" bran "	2,768 "
" oat sheaves "	6,240 "
Inside (Loose).	
No. of steers in lot	4
First weight, gross	4,070 lbs.
" average	1,017 "
Finished weight, gross	5,110 "
" average	1,277 "
Total gain in 154 days	1,040 "
Average gain per steer	260 "
Daily gain per steer	1·6 "
" lot	6·4 "
Gross cost of feed	$ 70 91
Cost of 100 lbs. gain	6 81
Cost of steers, 4,070 lbs. at 3¼c.	132 27
Total cost to produce beef	203 18
Sold, 5,110 lbs. at 5c. less 5 per cent.	242 75
Profit on lot	39 57
Net profit per steer	9 89
Average buying price per steer	33 07
" selling "	60 69
" increase in value per steer	27 62
Average cost of feed per steer	17 75
Amount of grain eaten by lot	4,724 lbs.
" straw "	4,800 "
" hay "	6,800 "
" ground flax eaten by lot	56 "
" bran "	764 "

Group of Cattle fed without shelter.

Group of Yaks, Experimental Farm, Brandon, Man.

The small gains are partly attributable to the cattle being poor feeders. Furthermore, small, immature cattle do not make as rapid gains as older cattle of the same type.

There is also to be considered the weather that those outside had to contend with. This affected their gains not so much through their being uncomfortable as by making it difficult for them to secure water. The only water available was in a coulée near their feeding place and the extremely severe weather rendered it impossible to keep the water open. Consequently, they had often to go without water if they were not at hand shortly after the ice was cut. This undoubtedly militated against their progress.

The outside lot was weighed periodically during the winter to determine when the greatest gains were made. The larger animals made fairly good gains throughout, but during the very severe weather in January and February some of the smaller cattle actually lost weight.

The average weights as determined from time to time were as follows:—

	Lbs.
December 16	981¾
January 16	986¾
February 13	988
March 10	1,010
March 24	1,071
April 7	1,095
May 10	1,101

In the figures given above, labour is not taken into consideration. Much more labour was involved with those fed inside than with the outside lot, so that, if a definite price were charged for labour, the showing would be more favourable to the outside lot.

In estimating the net profit per steer, a definite price of $1 per ton is placed on all the straw fed. Since straw is largely considered a waste product, the profit has also been figured without placing any value on the straw, the other feeds being valued at the same prices as before.

The following are the figures on the latter basis:—

	Profit per head.
Lot—outside	$ 1 77
Lot—inside (tied)	6 54
Lot—inside (loose)	10 49

Cattle feeding will not be largely followed unless a better price can be obtained for the grain by feeding it than by selling. To give a clearer idea of the price obtained in this case through feeding, it has been figured out by placing the values given above on the coarse fodders and valuing the bran at actual cost. We find that for the grain fed the following prices were secured:—

	Outside.	Inside (loose).	Inside (tied).
Per ton	20·78	36·73	31·51
Oats per bushel	·35	·62	·53
Barley per bushel	·49	·88	·75

The results for the two years this experiment has been under way have been so divergent that it has been deemed advisable to repeat it. Last year's experience has shown that a good water supply is essential and provision for this has been made by sinking a well and using a tank heater in the trough. This has been used with splendid success throughout the winter of 1909-10. Another change made this year was that of feeding a heavier meal ration earlier in the feeding period, the cattle

being put on full feed about the first of February. At the time of writing, the experiment is still under way and the results cannot be reported until next year.

SWINE.

The herd of swine on hand at present consists of 32 head, as follows:

Yorkshires—1 stock boar, 1 young boar and 6 females.
Berkshires—1 stock boar, 6 young boars and 10 females.
Tamworths—1 feeding pig.
Grades—7 feeding pigs.

These are kept for experimental feeding or for breeding. Several head of both sexes have been sold during the year for breeding purposes.

EXPERIMENT IN PASTURING PEAS.

An acre of brome sod was broken in the spring and sown to peas at the rate of 3 bushels per acre. When the peas were ripe, fifteen growing pigs were turned in and given about one-fifth of an acre at a time, a portable fence being used for hurdling. A record was kept of the weights when turned in and when taken off after all the peas had been eaten. No other grain was fed, but water was supplied to them freely.

Following are the results:—

Date turned on peas, Sept. 8, 1909.
Date when peas were finished, October 5, 1909.
Number of days on peas, 27.
Weight at start, 1,215 lbs.
Weight at finish, 1,538 lbs.
Gain in weight, 324 lbs.
Gain per day, 12 lbs.
Gain per pig per day, ·8 lbs.
Value of pork produced at 7 cts. per lb., $22.68.

PASTURES FOR PIGS.

Rape is used mainly as summer pasture for pigs and is found excellent for the purpose. It may be sown any time after the first of May, and at intervals during the summer. It will thrive on almost any soil, but the richer in plant food the soil is and the more thorough the cultivating, the better the results.

In Manitoba, where there is seldom much moisture to spare, rape should be sown on the level in rows about two feet apart. This permits it to be cultivated in the intervals. Four pounds of seed per acre is sufficient. It responds to cultivation with a rapid, vigorous growth and in from six to eight weeks is ready for use. It can be fed to best advantage by giving the pigs but a small area at a time and changing them to a new piece every ten days or two weeks. The rape grows up again after being eaten off if not pastured too closely and a comparatively small area may therefore be used continuously through the summer.

YAKS.

A herd of six yaks, which were presented to the Department of Agriculture by His Grace, the Duke of Bedford, was received here in July, 1909. The herd consisted of one aged bull, one yearling bull, two aged cows and two yearling heifers. They had been about four months on their way from England, including the time they were kept quarantined, and the two cows appeared to be somewhat the worse of the long confinement, but their condition improved when they were put on pasture.

The Yak (*Bos grunniens*) is a native of Thibet, a country of great altitude, intense cold and sparse vegetation. It is said to thrive on the rocky hillsides on a limited food supply and not to be inconvenienced by the cold or snow. Its coat is specially adapted to protect the animal against extreme cold, as it consists of a short woolly growth next the skin, and a longer, coarser hair, that on the throat, shoulders, belly and hams, being from six to ten inches long. The tail is very bushy and covers the hocks. The coarse hair is used by the Thibetans to make strong cloth, while the finer wool is manufactured into shawls and soft carpets.

In its native country, the Yak is domesticated and is used much as we use the ordinary ox in this country. They are considerably smaller than our ordinary cattle but resemble them in build except that they have a hump like the bison. Some authorities say that the mature bulls weigh 1,000 to 1,200 pounds, with the females somewhat smaller, but those that we have weigh little more than half this much.

The nature and habits of the Yak suggested the idea that they might prove useful in the extreme northern parts of Canada where, on account of excessive cold and deep snow, ordinary cattle cannot range without winter protection and feed. The offer of the Yaks to the Department was made by the Duke of Bedford on the suggestion of the naturalist, Ernest Thompson-Seton, Esq.

A range of about thirty-five acres of rough land was set apart for the herd. There is considerable natural shelter in the form of oak and poplar bluffs, and a creek in one of the coulées furnishes water. On the approach of severe weather, a shed was built to provide shelter from the wind and a well was sunk to ensure a supply of water in the winter. During the fall, they did more or less browsing but, as soon as they were fed hay and straw, they made no further effort to find their own living. During most of the winter they were fed a few pounds of grain once daily.

In January, we were unfortuante in losing the aged bull from enteritis, and, in March, one of the cows died. This cow had been sick for some time before arriving here and never seemed to regain her vigour. The other animals are in good health.

HORSES.

The horses consist of nine heavy work horses and three lighter horses used for driving and light work about the Farm. They have continued in good health during the year.

POULTRY.

Two breeds of poultry are kept: Barred Plymouth Rocks and Buff Orpingtons. Fairly good success was had with hatching, forty chickens being raised. A number of the cockerels were sold for breeding purposes. The flock at present consists of:

Barred Plymouth Rocks—2 cockerels and 14 hens.
Buff Orpingtons—3 cockerels and 10 hens.

BEES.

Of the eleven hives put into winter quarters in the fall of 1908, ten came through the winter in good condition and were put on their summer stands on May 3. The average loss in weight per hive during the winter was twelve pounds.

The early part of the season was favourable and each colony threw a swarm. The honey flow was good during July and forty-five pounds per hive was secured, but after the first of August, when the dry, hot weather set in, the flow ceased almost entirely. Very little was gathered after this date and considerable feeding was done in September. Fifteen hives were put into winter quarters in November, 1909.

THE VEGETABLE GARDEN.

On the whole, the season was favourable to the vegetable garden. The frost of 3½ degrees on June 14 did practically no damage. A torrential rain on June 28, accompanied by a terrific thunderstorm, did considerable injury to currant bushes, nearly all the new growth being broken off or so damaged that it had to be pruned off later. On July 8, an excessively strong wind at a high temperature did considerable damage to the vegetation. The cabbage and cauliflower were twisted and broken, and a number completely destroyed. The squash vines were also badly bruised, but these subsequently recovered.

The extremely hot weather during August and September favoured the growth of the corn, tomatoes, squash and cucumbers, but the bulbous crops suffered correspondingly. The tomatoes were a particular success this year. The first ripe fruit was gathered August 5, and a continuous supply was forthcoming until late in September. A light frost on August 29 damaged tomatoes, squash and corn. The squash recovered somewhat and the green tomatoes ripened indoors, but the corn was permanently injured. It would undoubtedly have ripened but for this slight frost, as we had three weeks of fine fall weather before the next frost on September 21.

The land used as a vegetable garden had produced a crop of roots in 1908 and had been fall-ploughed and packed, after receiving an application of manure. Spring weather was very backward so that there was little actual work on the ground until about the first of May. The soil worked down readily into a fine tilth, and the Planet Junior drill was used where practicable for sowing the seed. The germination of the seed was, on the whole, satisfactory. As soon as the plants were visible in the rows, the Planet Junior, with the hoe attached, was frequently used, and this effectively kept the ground clear of weeds and in a fine tilth for the conservation of moisture.

The Pocket Gopher (*Geomys bursarius*) again attacked practically everything in the garden and wrought considerable havoc. This pest, which has been increasing from year to year, would undoubtedly have done much greater damage had not over forty of them been trapped and destroyed. The habits of this animal are quite different to those of the ordinary gopher, and considerable study and practice is necessary to determine the proper method to follow to control them.

It is underground in habit and burrows long tunnels from place to place. Little mounds of earth on the surface indicate the direction of the tunnels. The mounds are formed at the ends of branch tunnels leading from the main one, and consist of the soil that has been dug from the main burrow. When, during this burrowing, they encounter a row of peas, carrots, beets, potatoes or other vegetable, their course follows the row, they devour the roots, and, in the case of most vegetables, the plants are killed at once. With potatoes, the plant is seldom killed outright but most of the tubers are nibbled and more or less injured. They also appear to be very partial to alfalfa and other clovers, and frequently destroy many flowers in the flower beds.

In appearance they are shorter and heavier built than the ordinary gopher, darker in colour, and have very heavy shoulders and front paws. The most distinguishing feature is the two pouches, one at either side of the head in which they carry food for storing, when not wanted for immediate use.

The gardener, in trapping them last year, took the following course. The traps were set between two of the mounds. When the run is located, a space is dug out with the garden trowel large enough to enable the trap to be set and placed on a level with the bottom of the run. This should be done with as little damage as possible to the run, and the hole should then be carefully covered with a sod and fine earth to exclude the light, leaving room for the trap to spring. By following this method nearly fifty were trapped in and around the gardens during the summer.

PARSNIPS.

Two varieties of parsnips were sown on May 4—Manitoba Prize Intermediate and Hollow Crown. Owing to the extremely dry weather, neither of the varieties attained a marketable size.

CARROTS.

The carrots were sown on May 4, French Horn and Improved Nantes being the varieties. Germination was good in both cases and an average crop was produced of roots of good shape and quality. The Improved Nantes proved the superior variety, being a heavier yielder, the roots more uniform and of better quality.

TURNIPS.

The first sowing of White Milan turnips was not successful. A second sowing on May 26 germinated satisfactorily and produced turnips ready for use early in July. These were of good quality while quite young, but soon became coarse and strong in flavour

ONIONS.

Two varieties of seed onions were sown on May 4; large Red Wethersfield and Paris Silverskin. Germination was good, but both varieties suffered heavily by a most determined attack of the onion maggot and, although frequent dustings of powdered hellebore were resorted to, it did not effectually arrest its progress. Shalots and Dutch Sets were planted on May 7. These were also attacked by the maggot, but did not suffer so severely as the onion grown from seed. Some extra good specimens of Danver's Yellow Globe were obtained from the Dutch Sets. In every variety, the onions which escaped the maggot were well up to the average size, and the prolonged dry weather in the fall enabled us to harvest them in splendid condition.

LETTUCE.

The first sowing of lettuce was made on May 8, followed by a succession of sowings at intervals of about ten days, the last being sown on June 22. The varieties were Wheeler's Tom Thumb, Cos Trianon, Neapolitan and All-the-Year-Round Wheeler's Tom Thumb, although producing heads of smaller size than the other varieties, proved superior in texture and flavour and remained in head for a much longer period without going to seed than any of the other varieties. Cos Trianon produced large, sound heads of excellent quality. Neapolitan, although a lettuce of fairly good flavour, was inclined to be loose in the head and coarse in texture. All-the-Year-Round did not seem to thrive from the start and was decidedly soft and of poor quality.

RADISH.

Successive sowings were made from May 4 at intervals of about two weeks. Thre varieties of summer radishes and one of the winter varieties were sown. These all germinated satisfactorily, but suffered very heavily from presistent attacks by a maggot which resembles the onion maggot in appearance and habits. The Long Black Spanish Winter Radish produced a very heavy crop, but was rendered unfit for use owing to the ravages of this pest.

Of the summer varieties, the Forcing Turnip Scarlet and Early Scarlet White-Tipped produced large crops of roots of good quality and flavour. The Olive Scarlet produced a heavy crop, but the roots lacked in quality, being coarse and of a strong flavour.

PEAS.

Four varieties of peas were sown this year, William Hurst and American Wonder on May 8. The first mentioned variety germinated weakly and was also damaged

by the pocket gopher and produced a very meagre crop. American Wonder produced a large crop of peas of splendid quality and flavour, fit for use on July 6. This sowing was followed by Nott's Excelsior on May 26; this pea proved to be of excellent quality and flavour, but the crop was considerably reduced by the dry weather. The next sowing of the same variety on June 10 also suffered from drought. Champion of England was reserved for late use and was sown on June 22. The germination was good, but, after a height of a few inches was reached, they seemed to be at a standstill for a long while owing, no doubt, to the lack of moisture. However, they benefited greatly by late rains and produced a fine crop of peas of splendid quality during September, a time when green peas were very much appreciated.

BEETS.

Egyptian Dark Red Flat and Nutting's Dwarf Improved were the two varieties grown this year. Germination was very good and both varieties yielded well up to the average in weight, but the roots were very large and, consequently, the texture was somewhat coarse.

BEANS.

Five varieties of beans were planted this year, one sowing on May 26 and a subsequent one on June 7. Germination was good in every case and green beans were ready in large quantities by July 20. The names of the varieties were as follows:—Fame of Vitry, Dwarf Extra Early, Dwarf Wax Every Day, Emperor of Russia and Dwarf Matchless. All of these ripened their seed, which was gathered in good condition.

TABLE CORN.

This season was particularly favourable for the production of table corn. Golden Bantam, the earliest and, in many ways, the best variety, was ready for use on August 14. The cobs of this variety are not so large as those of the other varieties grown, but the superior quality and flavour more than compensate for this deficiency. Early Fordhook and Seymour's Sweet Orange produced satisfactory results. Burpee's Earliest Catawba, a new sort, was a few days later than the two last-named varieties and the yield was very light for so favourable a season. The quality, however, was excellent. Dakota Sugar and Devitt's Earliest Sugar were also planted with seed that was saved here last year, but it failed to germinate.

SQUASH, PUMPKINS, MARROWS, ETC.

Very satisfactory results were obtained from these vegetables. Some exceptionally fine specimens of splendid quality were produced. The seeds were planted in hills in the garden on May 29. Of the varieties grown, the under-mentioned proved their superiority: Mammoth Whale and Hubbard Squash, Large Yellow Globe Pumpkin, and Long White Bush Marrow. The last-mentioned is to be particularly recommended for summer use, being ready ten days before other varieties, is very prolific, and being of a bush habit of growth, occupies a minimum of space in the garden.

CUCUMBERS.

Three varieties of outdoor or ridge cucumbers were planted in hills on May 29 with very satisfactory results. The names were as follows: Prolific, Cool and Crisp, and Chicago Pickling, all of which did remarkably well, producing a heavy and continuous yield

CITRON.

Four hills of the preserving or red-seeded variety were planted on May 29. These produced a most satisfactory return, over eighty fine specimens being gathered, some of them weighing up to 7½ lbs. each.

CAULIFLOWER.

Two varieties of cauliflower were sown in boxes in hotbeds on April 20 and were planted out on June 5. A previous sowing was made on April 8, but, owing to some unexplainable cause, our propagating house became ignited and it and practically all our seeds for the season were destroyed. We then had to resort to hotbeds and this caused a delay in starting those vegetable seeds which it was necessary to propagate indoors.

The cauliflower plants made rapid growth for several weeks but with dry weather they suffered considerably. The cabbage worm also did considerable damage to this vegetable. The varieties grown were Earliest Dwarf Erfurt and Early Snowball.

CABBAGE.

Two varieties of early cabbage were sown in boxes in the hotbed on April 20—Early Paris Market and Early Jersey Wakefield. The first-named again proved its superiority, producing sounder and heavier heads ready for use ten days before the latter.

Fottler's Drumhead was grown for fall and winter use, the method of propagating being the same as with the early varieties. Good, shapely heads were produced of fair quality, weighing, on an average, five and a half pounds each.

Some splendid specimens of the Red Pickling cabbage were grown this year, some of the heads weighing up to 8 lbs. each.

Brussels Sprouts were started and grown under the same conditions as mentioned above, but, owing to lack of moisture when the sprouts should have been developing, they did not produce a crop.

Owing to the continued drought this season, all the cabbage family were more or less adversely affected. They also received some injury from the cabbage worm, but successive dustings of pyrethrum powder gave satisfactory results.

TOMATOES.

The season of 1909 was undoubtedly most favourable for tomato culture. Sixty per cent of an unusually heavy crop ripened on the plant but, owing to an unfortunate frost on August 29, it was necessary to gather the balance of the fruit, practically all of which ripened indoors in a few days.

Two strains of seed of the Earliana tomato were sown. The strain obtained through a seedsman was sown in the hotbed on April 10 and selected seed from the Central Farm at Ottawa on April 20. These were both planted out in the garden on June 5. Although the selected seed was sown ten days later than the other, it ripened its fruit quite as early, bore a heavier crop and was decidedly superior in every way, producing shapely, clean, smooth specimens of great size.

The importance of staking and pruning the tomato plant was illustrated to a very noticeable extent. The lateral or side shoots which grow at every junction of a leaf with the main stem were not allowed to grow, consequently the main stem, which was from time to time attached to the stake for support, obtained is maximum in size and strength and produced enormous bunches of large, shapely fruit. When four or five bunches of fruit had set, the top of the plant was cut off and the entire energy of the plant was thus directed to the production of fruit. Had the plant not been pruned, it would have grown a large quantity of unnecessary wood and robbed the fruit accordingly. Other advantages of staking and pruning are, that the plant is kept in an upright position whereby all the fruits received the maximum amount of sunshine; the fruit is also kept high and dry and always in a clean, attractive condition.

WONDERBERRY.

Some seed of this berry was sown in a hotbed on April 20 and planted in the garden on June 5. It made rapid growth of a rank, bushy character, and bore abundance of berries right up till late frosts. Although of the same family as the tomato, it is of a hardier nature, thriving and growing for weeks after the tomato vines were destroyed by frost. Large quantities of the berries ripened, and, when preserved, made a very acceptable fruit, the flavour resembling to some extent that of the Thimbleberry or Blackberry.

SWISS CHARD OR SPINACH BEET.

A small quantity of this little-known but useful vegetable was sown in the garden on May 26. Germination was good and growth very rapid, and it soon produced an abundance of succulent greens of good flavour which remained fit for use till late in the season.

CELERY.

Our first sowing of celery was, unfortunately, lost with the burning of the propagating house, but some later plants were obtained and planted out in prepared trenches on June 15. Considering the extremely dry season, these made good progress and a number of stalks of fair size and good quality were dug on October 19.

RHUBARB.

The rhubarb beds received a heavy top-dressing of barn-yard manure last fall, and produced an enormous crop of large stalks of splendid quality. Tottle's Improved is especially a very desirable variety. This produced rhubarb ready for use by the last week of May, and, later in the season, stalks weighing up to fifteen and sixteen ounces each, of good tender rhubarb, were gathered.

FRUITS.

PLUMS.

Although growth did not start so early this spring as in some years, the season was a very favourable one for plums, the abundant sunshine and absence of severe frost till late in the fall, enabling us to harvest ninety per cent of a fairly heavy crop. A pail of plums of a late bearing seedling of the Cheney plum was gathered in splendid condition at the unusually late date of October 7.

The Major plums, a selection of the Manitoba wild plum, are still the first by ten days to ripen fruit, being ready this year on August 20. Plum South Dakota No. 7, fruited for the first time, producing a few plums of good size and flavour, which ripened about the last of August. The fruit is larger than the native plum, and this variety promises to be very useful. A few Cheney plums also bore fruit, as well as several seedlings of the Cheney. Trees of the selected varieties of the native plum should, without doubt, be grown by every farmer in this province. They are hardy, require little attention, are heavy croppers, and will produce ripe fruit of very acceptable quality, in any ordinary season.

APPLES.

Our apple orchards have again suffered very seriously from blight. It was, however, not nearly so bad as last year and, as very few trees were attacked during the late summer, we may from now on have comparatively little trouble from it. Considering the large number of trees that were blighted, a fairly good crop of fruit was harvested.

The following varieties of standard apples fruited this year: Hibernal, Duchess, Repka Kislaga, and Sweet Russet. These varieties have withstood the climate satisfactorily for several years and have not been as subject to blight as many of the other varieties. A number of the cross-bred apples fruited again, many of them producing very heavy crops. The principal ones were Columbia, No. 179, No. 167, Tony, Elsa, and Northern Queen. Several seedlings also fruited, but only two or three were at all promising.

The vacancies in the orchards caused by the blight were filled with a number of varieties of the cross-breds.

CURRANTS.

The plantation of currants set out in the spring of 1908 made splendid progress. Although all the bushes are comparatively small, nearly every variety bore fruit this year. Owing to an extremely heavy fall of rain on June 28 (when three-quarters of an inch fell in half an hour) nearly the whole of this year's growth of wood was broken off or rendered useless, which has, of course, adversely affected the progress of the bushes this season.

The following table gives the yield from one bush of a number of the heaviest yielding varieties.

Black.			Red.			White.		
	Lbs.	Ozs.		Lbs.	Ozs.		Lbs.	Ozs.
Topsy	2	9	Cherry	4	0	Verrier's White	1	2
Saunders	1	12	La Conde	3	8	White Grape	1	0
Black Grape	1	4	Cumberland Red	2	10	Large White	..	15
Kerry	1	3	Pomona	2	10	White Kaiser	..	14
Kentish Hero	..	14	New Red Dutch	2	3	Climax	..	12
Ontario	..	14	North Star	2	2	Brandenberg	..	10
Ethel	..	13	Simcoe	1	14	White Pearl	..	7
Eagle	..	13	Prince Albert	1	6	White Cherry	..	7
Climax	..	12	Raby Castle	1	3	White Dutch	..	5
Dominion	..	12	La Fertile	..	13	Admirable	..	4

GOOSEBERRIES.

The three varieties, Companion, Rideau and Carman, survived the winter, but were frozen back to the snow line, consequently there was not much wood left for bearing fruit. A small quantity of fruit was gathered from Rideau.

The undermentioned varieties were received from Ottawa this spring and made fairly good progress: Pearl, Downing, Whitesmith and Smith's Improved.

RASPBERRIES.

Owing to the fact that a great number of the raspberries planted last year failed to grow, it was necessary to re-arrange the plantation and fill up the vacant places with new canes which were obtained from Ottawa. The names of the varieties planted this spring are as follows: Highland Hardy, Thompson's Early, Herbert, Phœnix, Percy, Brandywine, Sarah, Golden Queen.

Of the varieties planted in the spring of 1908, Golden Queen, Columbia and Ruby Red withstood the rigours of the climate best. The Columbia made extensive growth this year, but it is of a long, sprawling character and would appear to be very liable to sustain injury and become twisted and broken by the strong winds. There was no fruit worth recording produced by any of the varieties this season.

With the object in view of ascertaining which are the hardiest and most frost-resisting varieties of raspberries, none of the canes were protected or buried last fall.

STRAWBERRIES.

Ten varieties of strawberries were received from Ottawa this spring as follows: Splendid, Beder-wood, Pocomoke, Senator Dunlap, Crescent, Uncle Jim, Enhance, Tennessee Prolific, Clyde, Lovett. Considering the very dry season, these made splendid growth and were well established plants by the fall. A covering of strawy manure was applied early in November and we hope to report favourably on the results next year.

THE FLOWER GARDEN.

The flower gardens, both perennial and annual, were again a source of attraction and admiration. In the perennial garden we had a practically unbroken supply of bloom and colour from early spring, when the irises burst into their gorgeous blaze of varied colours, till late in October, when the frost blackened the flowers of the Pyrethrum which were in profusion even at that late date. The Pæony in its various colours and fresh rich-looking foliage is to be highly recommended. Amongst other hardy and suitable perennials are Campanula, Phlox, Sweet William, Columbine, Lychnis, Delphinium, Anemone (wind flower), Dahlias, Gypsophila, Yarrow, Speedwell, Flowering Heliotrope and American Bugbane (*Cimicifuga racemosa*).

A bed of mixed pansies, which were propagated last year, were protected in the fall by a covering of dry leaves. This was carefully removed in the spring when danger of severe frost was past. Scarcely any winter-killing resulted by this treatment, spring growth soon started and the diversity of colours and profusion of bloom, which continued till late in the summer, were very pleasing.

We were somewhat handicapped with our annuals by losing our propagating house by fire. This, unfortunately, happened two days after all the seeds were sown, thus the loss was doubled, inasmuch as we lost our season's supply of seeds in addition to the building. Although considerable delay was therefore unavoidable, we made a second sowing in hotbeds on April 20 and 22 with fairly satisfactory results. The plants were subsequently set out in the garden during the first week in June and, although they made splendid progress for six or eight weeks and produced a great display of bloom, the flowering period was considerably curtailed by the very dry season. The following flowers were started in the hotbeds: Stocks, Antirrhinum, Summer Chrysanthemum, Balsam, Petunia, Centaurea, Calliopsis, Ageratum, Asters, Gaillardia, Marigold, Phlox, Dianthus, Verbena, Zinnia, Scabiosa and Pansies.

Twenty-six varieties of sweet peas were planted, but the dry season had a very adverse effect. The growth was weak and the blooms produced were considerably below the average in size. The somewhat late date at which these were sown was partly accountable for the poor results.

A sowing of sweet peas was also made this fall on October 28, when fourteen varieties of seeds, saved here in 1908, were sown.

The annuals, which did not receive the benefit of the hotbed treatment, were sown from the 5th to the 8th of June. Germination was somewhat uneven and, owing to a very heavy downfall of rain on June 28, many of the small seedlings were either buried or washed out entirely.

Those that remained suffered considerably from drought for a long while, but revived after late rains and gave a fairly good display, although late in the season. The names of the flowers sown out-of-doors which flowered successfully were Portulaca, Abronia, Eschscholtzia, Candy Tuft, Godetia, Nicotiana, Bartonia, Everlasting Flower, Poppies in variety, and some of all the varieties that were started in the hotbeds.

DAHLIAS.

The dahlia roots came out of their winter storage in good condition. They were then placed in a cold frame and soon made vigorous growth, but, after removal to

the flower garden, they suffered considerably on account of the dry weather and did not produce the best results.

ROSES.

As in most previous cases, practically all the roses but the *Rosa rugosa* and the Yellow Persian rose, were killed back to the ground. These two varieties, however, stood the winter without any covering or protection and bore quite a quantity of good blooms. A few blooms were also obtained from *Rugosa alba* and New Century. The Crimson Rambler and Lady Helen Gould both made good growth but did not produce any bloom.

BULBS.

A consignment of bulbs of different kinds received from the Central Experimental Farm in the autumn were planted immediately on arrival. They consisted of Hyacinths, Tulips, Daffodils, Squills, Snowdrops, Crocus and Spanish Iris. The Hyacinths and Daffodils were planted in pots for house bloom during the winter and were very satisfactory. The Tulips gave a splendid display of bloom and were a source of much admiration.

The Crocus bulbs rotted in the ground and the Squills, Snowdrops and Spanish Iris, although not entirely winter-killed, did not produce bloom and therefore cannot be considered a success.

AGRICULTURAL MEETINGS.

During the year, a number of farmers' meetings have been attended, as much time as possible being devoted to this work during the winter.

In January, I acted as one of the grain judges at the Provincial Grain Show for Saskatchewan, held at Regina January 15, to 28, and addressed the Agricultural Societies' Convention on 'The Functions of an Agricultural Society.' Short talks were also given on 'Promising new Varieties of Wheat' and 'Alfalfa-growing.' At the Agricultural Societies' Grain Show, in Winnipeg, in February, I assisted in the judging of the grain and at the Short Course in Grain and Stock judging, took several of the classes in grain-judging. At the Manitoba Winter Fair and Fat Stock Show, in Brandon, March 5 to 11, I gave an address on 'Alfalfa-growing' and reviewed the results of some of our experiments in the feeding of steers. I also discussed our steer feeding experiments at the Fat Stock Show held in Regina March 22 to 25.

Seed fairs were attended at Cypress River, February 2; Reston, February 4, and Carberry, February 8, and a Farmers' Institute meeting at Holland on February 26. All of these meetings were well attended.

DISTRIBUTION OF SAMPLES.

The distribution of samples of grain, potatoes, trees, shrubs, &c., has been continued and, during the past year, the following material has been sent out:—

Wheat in 3-lb. bags	51
Oats in 3-lb. bags	48
Barley in 3-lb. bags	22
Peas in 3-lb. bags	17
Potatoes in 3-lb. bags	252
Total number of samples sent out	390

CORRESPONDENCE.

Since the last report, 3,006 letters have been received and 2,864 despatched, irrespective of circulars sent out.

METEOROLOGICAL RECORD FOR BRANDON.

Months.	Highest Temperature.		Lowest Temperature.		Total Rainfall.	Total Snowfall.	Hours Bright Sunshine.
1909.	Date.	Deg.	Date.	Deg.	Inches.	Inches.	Hours.
April	25	58·9	27	8·	·11	10	196·4
May	4	81·5	1	9·	2·53	....	231·0
June	29	88·5	14	28·	2·62	....	239·2
July	(1 & 30)	86·	3	39·	3·20	....	253·3
August	20	95·5	29	30·5	·38	....	298·4
September	11	90·	22	28·	1·03	....	242 7
October	6	84·5	27	0·	·37	·5	124·3
November	4	58·9	21	—22·2	·17	14	112·9
December	1	36·9	9	—45·4	....	27	49·2
1910.							
January	31	32·9	4	—38·3	....	2	119·9
February	28	39·9	22	—38·3	....	3	145·
March	23	78·	9	0·	1·21	4	183·1
					11·62	*60·5	2,189·4

* Taking 10 inches of snowfall as equivalent to 1 inch of rainfall, the total precipitation for the year ending March 31, 1910 was 17·67 inches.

I have the honour to be, sir,

Your obedient servant,

JAMES MURRAY,

Superintendent.

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

INDIAN HEAD, SASK., March 31, 1910.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you the twenty-second annual report of the Experimental Farm for Southern Saskatchewan, at Indian Head, for the year ending March 31, 1909.

The past season was, without exception, the most favourable for the growing of grain crops that the province has ever experienced.

A few districts suffered from too little moisture, others from too much, but all had good returns and many very good.

The winter of 1908-1909 was marked by the very cold weather of January, but was moderate during the rest of the winter. Very little snow fell.

Seeding was general from April 15 to 19, but snow and frost at the end of the month delayed the work.

In no previous spring did grain come up so evenly, or make better progress. No set-backs took place during the entire season.

Wheat in the Indian Head district, and in others with heavy soil, suffered in yield from too much rain and heat while the grain was ripening.

Harvest was general about August 25, and from that time until all grain in the province was in stook, the weather was unexcelled.

Threshing had equally favourable weather, and, except in new districts where machines were scarce, no delay took place, the work being finished long before cold weather set in.

CROPS ON THE EXPERIMENTAL FARM.

On the Experimental Farm, seeding started on April 17, barley harvest on August 13, and threshing on September 10.

Heavy rains between July 26 and August 9 (5·67 inches in all) lodged nearly all grain on the Farm, making it necessary to cut it one way, also causing much smaller yields than would otherwise have been obtained. Very hot weather followed each rain and wheat especially suffered, though oats and barley, being further advanced when lodged, were not injured to the same extent.

The hay crop was satisfactory, but incessant rains after cutting commenced made the curing difficult.

Roots gave good returns. Corn and potatoes were especially good, and were secured without loss. A heavy frost on October 13 injured turnips and mangels, and destroyed a great many potatoes throughout the province.

Vegetables of all sorts were abundant on the Farm and everywhere through the province. Tomatoes, which seldom ripen, did so without protection.

Fruits gave large crops. Trees and shrubs, starting very early in the spring, made good growth during the entire season owing to the rain and heat.

WHEAT EXPERIMENTS.

All varieties of wheat in plots and in fields gave promise of a record yield up to July 27, after which very heavy rains set in, and, with extremely hot weather, rust struck the straw. Wherever lodged, the grain was shrunken and the yield greatly reduced.

Spring Wheat—Test of Varieties.

Thirteen varieties of spring wheat were sown on April 27 or May 4. A heavy snow-storm delayed seeding after five plots had been sown. The land was a clay loam, fallowed the previous year. All sorts were more or less rusted, and all were badly lodged.

One variety of Durum wheat (Kubanka) was sown on May 4, under the same conditions as the sorts referred to above. All the plots were one-twentieth acre in size.

Spring Wheat.—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		Inches.		Lbs.	B.	lbs.	Lbs.
1	Marquis..........	Aug. 22	117	46	Medium	3	Beardless	4,430	37	30	63
2	Huron Selected...	26	114	47	"	$4\frac{1}{2}$	Bearded	5,890	33	20	$58\frac{1}{4}$
3	Preston	22	110	47	"	4	"	5,430	33	20	62
4	Stanley A........	23	111	48	"	$3\frac{1}{4}$	Beardless	4,680	31	40	$57\frac{3}{4}$
5	Riga....	20	103	46	"	$3\frac{1}{2}$	"	4,550	31	10	$58\frac{1}{3}$
6	Bishop	19	114	49	Weak	3	"	6.390	28	50	$58\frac{3}{4}$
7	Bobs.....	19	114	44	Strong	$3\frac{1}{4}$	"	5,000	28	40	58
8	Pringle's Champlain	25	113	43	Medium	4	Bearded	4,080	27	..	58
9	Chelsea.	19	114	45	"	$3\frac{1}{2}$	Beardless	4,820	26	40	57
10	Red Fife H.......	28	123	44	Weak	3	"	4,950	24	50	58
11	Percy A	23	111	46	Medium	$3\frac{1}{2}$	"	3,540	24	40	55
12	White Fife..	28	116	52	"	4	"	4,450	23	50	$55\frac{1}{4}$
13	Hungarian White.	28	116	47	"	$4\frac{1}{2}$	Bearded	4,730	23	10	$58\frac{1}{2}$
	Durum Wheat.										
	Kubanka.........	Aug. 24	112	50	Weak	3	Bearded	3,520	34	20	63

TEST OF SPRING WHEAT IN FIELD LOTS.

Seven varieties were sown in field lots on fallowed clay loam between April 19 and 24, at the rate of $1\frac{1}{2}$ bushels per acre. Like the grain in the plots, all were injured by the excessive rain and heat. The Stanley and Marquis varieties were slightly rusted, and Bobs and Chelsea badly so.

SPRING WHEAT.—Test of Varieties in Field Lots.

No. of Plot.	Name of Variety.	Size in Acres.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Yield per Acre.	
						Inches.		Inches.		B.	L.
1	Huron Selected	4·67	Apl. 24	Aug. 26	124	36	Strong	3½	Bearded	36	..
2	Preston	6·42	24	26	124	46	Medium	3½	"	31	50
3	Huron Selected	3·25	24	26	124	40	Strong	4	"	30	10
4	Red Fife H	20·12	20	Sept. 1	134	45	"	3½	Bald	28	45
5	Stanley A	5·03	22	Aug. 25	125	46	Medium	3¾	"	28	15
6	Red Fife H	5·59	23	Sept. 1	131	45	Strong	3½	"	26	35
7	Bobs	3·46	23	Aug. 23	122	38	"	3	"	26	17
8	Marquis B	5·00	22	25	125	42	"	3¼	"	25	3
9	Red Fife (on Stubble)	4·21	19	24	127	45	"	3½	"	17	48
10	Chelsea	4·94	20	24	126	41	"	3¼	"	14	54

SPRING WHEAT—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Huron Selected	Fallow	4·67	36	0	168	7
Preston	"	6·42	31	50	204	22
Huron Selected	"	3·25	30	10	98	2
Red Fife H	"	20·12	28	45	578	27
Stanley A	"	5·03	28	15	142	6
Red Fife H	"	5·59	26	35	148	42
Bobs	"	3·46	26	17	90	56
Marquis B	"	5·00	25	3	125	15
Red Fife H	Barley stubble	4·21	17	48	74	56
Chelsea	Fallow	4·94	14	54	73	36
		62·69			1,704	29

Average yield per acre: 27 bushels, 11 pounds.

FALL WHEAT.

Turkey Red fall wheat was sown on August 13, 21 and 31, and Kharkov on September 19, 1908. Until April 15 the grain looked promising, but frosts and thaws from then up to May 1 killed the crop, except in small patches sheltered by trees.

EXPERIMENTS WITH OATS.

TEST OF VARIETIES.

Twenty-three varieties of oats were sown in uniform plots on May 10 at the rate of about 2 bushels per acre. The soil was a clay loam, fallowed the previous season. All varieties were very heavy in straw with more or less rust, and were badly knocked down on July 27 by a heavy wind and rain storm (2·64 inches). Heavy rain on August 5 and 9 completely flattened all plots, and all had to be cut by mower. The plot of Banner suffered more than the others from lodging and gave, with one exception, the smallest yield, while in field lots it heads the list. The plots were each one-twentieth of an acre.

OATS—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Average length of Straw, includ'g Head	Character of Straw.	Average length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bush. after Cleaning.
				Inches.		Inches		Lbs.	Bush.	Lbs.	Lbs.
1	Pioneer	Aug. 25	107	46	Weak..	9	Branching	5,240	82	32	37¼
2	Virginia White	" 23	105	47	" ..	7	"	3,460	82	22	38
3	White Giant	" 23	105	49	" ..	9	"	5,460	82	22	37
4	Danish Island	" 25	107	48	" ..	8	"	4,400	81	06	40½
5	Thousand Dollar	" 22	104	51	" ..	9	"	5,500	81	06	38½
6	Twentieth Century	" 23	105	50	" ..	8	"	5,100	81	06	39½
7	Orloff	" 12	94	42	" ..	7	"	3,220	77	22	33
8	Siberian	" 23	105	44	" ..	8	"	3,040	77	02	40¾
9	Wide Awake	" 23	105	50	" ..	8	"	3,260	76	16	39
10	Alsasman	" 20	102	47	" ..	8	"	4,260	76	16	40
11	Abundance	" 23	105	45	" ..	9	"	5,680	76	6	40¼
12	Improved Ligowo	" 22	104	43	" ..	8	"	5,000	75	10	41
13	Kendal White	" 24	106	56	" ..	9	"	3,180	72	32	40½
14	'Regenerated' Abundance	" 24	106	50	" ..	9	"	3,780	72	32	35½
15	Swedish Select	" 20	102	50	" ..	8	"	3,860	70	30	40½
16	Lincoln	" 25	107	50	" ..	9	"	5,540	68	8	42½
17	Storm King	" 22	104	47	" ..	10	Sided	5,140	68	8	40
18	Irish Victor	" 26	108	46	" ..	9	Branching	5,180	67	2	40
19	Improved American	" 22	107	43	" ..	8	"	5,000	65	30	41½
20	American Triumph	" 23	105	48	" .	7	"	4,680	64	14	38¼
21	Milford White	" 25	107	48	" ..	9	Sided	4,520	63	8	42½
22	Banner	" 25	107	49	" ..	8	Branching	5,120	62	32	..
23	Golden Beauty	" 26	108	43	" ..	8	"	4,800	60	20	37

TEST OF OATS IN FIELD LOTS.

Six varieties of oats were grown in field lots, on fallowed land, sown from May 5 to 8; two bushels of seed was sown per acre. All sorts were more or less lodged from the large crop of straw and heavy rains. Except a few acres of Banner, all had to be cut one way.

OATS—Test of Varieties in Field Lots.

No. of Plot.	Name of Variety.	Size of Lot.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Yield per Acre.	
		Acres				In.		In.		Bush.	Lbs.
1	Banner	1.30	May 7.	Aug. 27.	112	49	Weak.....	8	Branching	94	27
2	White Giant	4.03	" 6.	" 26.	112	50	Medium..	8	" ..	94	17
3	Banner	12.93	" 5.	" 23.	110	50	" ...	8	" ..	92	..
4	Danish Island	4.14	" 6.	" 25.	111	45	" ..	7	" ..	92	..
5	Abundance 'Regenerated'.	3.64	" 7.	" 23.	108	50	Weak.....	8	" ..	89	3
6	Wide Awake	7.16	" 6.	" 24.	110	46	Medium. .	8	Sided.....	86	6
7	Banner	3.00	" 8.	" 26.	110	50	" ..	8	Branching	85	25
8	Improved Ligowo	3.20	" 7.	" 24.	109	47	Strong....	7	" ..	70	28

OATS—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Banner	Fallow	1·30	94	27	123	8
White Giant	"	4·03	94	17	382	22
Banner	After Peas & Roots	12·93	92	0	1,189	19
Danish Island	Fallow	4·14	92	0	380	30
Abundance 'Regenerated'	"	3·64	89	3	324	10
Wide Awake	"	7·16	86	6	617	0
Banner	"	3·00	85	25	257	7
Improved Ligowo	"	3·20	70	28	286	21
		39·40			3,501	15

Average yield per acre: 88 bushels, 30 pounds.

EXPERIMENTS WITH BARLEY.

All varieties in tests and in field lots were very heavy in straw and in all cases had to be cut one way. The grain was badly coloured on account of the heavy rains.

SIX-ROWED BARLEY.—TEST OF VARIETIES.

Eleven varieties of six-rowed barley were sown on the 10th of May at the rate of two bushels to the acre. The soil was a clay loam, fallowed the previous year, and all plots were one-twentieth of an acre in size.

SIX-ROWED BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Average length of Straw including Head.	Character of Straw.	Average length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Oderbruch	Aug. 14	96	32	Weak	2¾	2,180	61	2	52¼
2	Nugent	" 12	94	41	Medium	2¼	3,250	55	10	50
3	Mensury	" 12	94	37	"	2¾	3,260	54	8	49½
4	Claude	" 12	94	38	"	2¼	3,235	52	24	50
5	Odessa	" 14	96	37	"	2½	2,820	52	24	50¾
6	Trooper	" 11	93	42	"	2¾	2,610	49	8	50
7	Mansfield	" 14	96	37	"	2½	2,500	48	36	51
8	Black	" 8	90	38	Weak	1¾	2,580	48	36	..
9	Albert	" 12	94	37	Medium	3	3,600	47	4	50
10	Yale	" 14	96	33	"	2½	3,680	46	12	51
11	Stella	" 11	93	38	"	3	2,650	45		50½

TWO-ROWED BARLEY.—TEST OF VARIETIES.

Ten varieties of two-rowed barley were sown on the 12th of May on clay loam, fallowed the previous season. All were badly lodged and the grain coloured by rain. Two bushels of seed were sown per acre, and all plots were one-twentieth of an acre in size.

TWO-ROWED BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Gordon	Aug.	16	98	52	Strong	2½	2,410	52	14	53½
2	Jarvis	"	19	101	49	Medium	4	2,780	48	36	54
3	Canadian Thorpe	"	16	98	42	"	3	2,160	45	40	52½
4	Clifford	"	16	98	47	Weak	3	2,400	45	40	53½
5	Invincible	"	19	101	44	Medium	2½	3,930	45	20	53½
6	Danish Chevalier	"	19	101	53	"	4	2,640	41	32	51½
7	Swedish Chevalier	"	19	101	40	Weak	4	2,240	40	30	—
8	Standwell	"	18	100	40	Medium	3½	4,070	40	20	53¼
9	French Chevalier	"	19	101	56	"	4½	4,320	33	16	51
10	Beaver	"	17	99	34	"	4	3,620	32	44	51½

FIELD LOTS OF BARLEY.

Seven sorts of barley were sown in field lots on May 7 and 8, the land having been fallowed the previous year. All had to be cut one way. The grain was badly coloured, and, in most cases, a good deal shrunken. Two bushels of seed were sown per acre.

BARLEY—Test of Varieties in Field Lots.

Number.	Name of Variety.	Size.	Date of Ripening.		No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Yield per Acre.	
		Acres.				Inches.		In.		Bush.	Lbs.
1	Claude	3·50	Aug.	13	97	40	Medium	2½	6 rowed	75	39
2	Mensury	13·91	"	13	97	39	"	2½	6 "	51	50
3	Canadian Thorpe	3·04	"	18	103	44	"	2½	2 "	45	30
4	Invincible	1·84	"	19	103	37	"	3¼	2 "	44	24
5	Standwell	3·29	"	19	104	38	"	3	2 "	40	25
6	Mansfield	2·64	"	13	97	39	"	2¼	6 "	38	20
7	Sidney	1·97	"	14	99	43	"	4	2 "	35	0

BARLEY—Total and Average Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Claude	Fallowed	3·50	75	39	265	16
Mensury	"	13·91	51	50	723	23
Canadian Thorpe	"	3·04	45	30	138	34
Invincible	"	1·84	44	24	81	32
Standwell	"	3·29	40	25	133	15
Mansfield	"	2·64	38	20	101	20
Sidney	"	1 97	35	0	68	45
		30·19			1,512	41

Average yield per acre, 50 bushels 4 pounds.

EXPERIMENTS WITH FIELD PEAS

TEST OF VARIETIES.

Sixteen varieties of peas were sown on May 11 in one-twentieth acre uniform plots on clay loam on which roots had been grown the previous season. The land was ploughed when the roots were taken up. All varieties gave good yields, all ripened perfectly, and were good samples. The seed was sown at the rate of from 2 to 3 bushels per acre according to the size of the pea.

In this province, considerable risk is run of winds blowing the crop of peas over the farm if a storm arises after they are pulled, and before stacking or housing.

To overcome this risk, for several years it has been the practice to allow all varieties to become dead ripe; then harvest and stack at the same time, with a pea harvester attached to the mowing machine. A crop can thus be easily and quickly secured.

It is found that peas that have stood a week or ten days after getting ripe, do not shell any more than, if as much as, when pulled earlier.

PEAS—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel
					In.	In.		Bush.	Lbs.	Lbs.
1	Mackay	Aug. 30	111	Strong	55	2½	Large	58	0	64¾
2	Prince	" 28	109	"	62	2½	Small.	56	20	64½
3	Gregory	" 26	107	"	56	2¼	Medium.	54	40	64
4	English Grey	" 28	109	"	60	2	Large	48	0	64
5	Arthur	" 26	107	"	53	2¼	"	47	20	65
6	Paragon	" 29	110	"	60	2½	Medium	46	40	64¾
7	Picton	" 30	111	"	58	2	"	46	40	64¾
8	Victoria	" 28	109	"	55	3	"	46	40	65
9	Chancellor	" 26	107	"	58	2½	Small	45	40	64½
10	Prussian Blue	" 28	109	"	57	3	Medium.	45	0	65
11	White Marrowfat	" 30	111	"	63	3½	Large	45	0	63½
12	Black-eye Marrowfat	" 30	111	"	65	3	"	43	40	64
13	Daniel O'Rourke	" 22	103	"	52	2	Small.	42	20	64¾
14	Early Britain	" 30	111	"	56	3	"	42	20	62½
15	Golden Vine	" 25	106	"	48	1¾	"	39	0	66½
16	Wisconsin Blue	" 30	111	"	61	2½	"	34	0	65

PEAS IN FIELD LOTS.

Five varieties were sown in large plots, on clay loam in roots the previous year, nd one of the five sorts was sown in addition on Western Rye Grass sod, ploughed ust before sowing. As will be seen, the root land gave the better yield.

Peas in Field Lots.

No. of Plot.	Name of Variety.	Cultivation.	Size of Plot.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Yield per Acre.	
			Acres.					Bush.	Lbs.
1	Arthur	After roots.	2·65	May 10.	Aug. 25..	107	Strong ...	60	9
2	Archer	"	0·45	" 10..	" 26..	108	"	56	40
3	Golden Vine	"	1·77	" 10..	" 25..	107	"	56	5
4	Golden Vine	W. rye sod..	1·16	" 14..	" 26..	104	"	50	53
5	Victoria	After roots.	0·45	" 10..	" 28..	110	"	44	38
6	Gregory	"	0·20	" 10..	" 26..	108	"	43	45

SMUT TEST.

Red Fife Wheat was treated with bluestone and with formalin, and a plot was sown without being treated. No smutty heads were found in any of the three plots. On a two-acre field of Huron wheat there was considerable smut, while on a four-acre field of the same variety the crop was entirely free. None of the other wheats were affected.

Red Fife treated with 1 lb. bluestone in 10 gallons of water showed no smut and yielded 26 bushels per acre; Red Fife treated with 1 lb. formalin in 40 gallons of water showed no smut and yielded 22·20 bushels per acre; Red Fife, untreated, showed no smut and yielded 22·10 bush. per acre.

ROTATION OF CROPS.

These tests were commenced in 1899. Below will be found the order of rotation for the past three years, with yields, &c., of each plot in 1909. The plots are each one-half acre in size, the soil being clay loam. The preparation of the soil for the 1909 crop was ploughing 5 or 6 inches deep in the fall when the grain was removed, and cultivating shallow in the spring. In some cases a certain amount of rust was present.

ORDER OF ROTATION.

No.	1907.	1908.	1909.	No.	1907.	1908.	1909.
1	Peas	Wheat	Oats	12	Fallow	Wheat	Wheat
2	Tares	"	Wheat	13	"	"	Oats
3	Alsike	"	Oats	14	"	"	Barley
4	Red Clover	"	Wheat	15	Oats	"	Wheat
5	Alfalfa	"	Barley	16	"	"	Barley
6	Wheat	Peas	Wheat	17	Wheat	Oats	Red Clover
7	Oats	Tares	"	18	"	Emmer	Peas
8	"	Alsika	"	19	"	Oats	Tares
9	Wheat	Red Clover	"	20	"	Wheat	Alsike
10	Barley	Alfalfa	"	21	"	Barley	Alfalfa
11	Fallow	Wheat	"	22	"	"	Fallow

ROTATION TEST IN 1909.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		Ins.	Bush.	Lbs.	Lbs.
1	Oats, Banner........	April 26..	Aug. 20..	116	40	Strong	9	62	0	44½
2	Wheat, Red Fife...........	" 26..	" 25..	121	40	"	2½	14	40	55¾
3	Oats, Banner	" 26..	" 20..	116	43	"	8	42	26	42½
4	Wheat, Red Fife..........	" 26..	" 25..	121	36	"	3	11	8	58½
5	Barley, Mensury..........	" 26..	" 13..	109	38	"	3	26	6	0
6	Wheat, Red Fife....	" 26..	" 25..	121	43	"	3¼	12	16	55
7	" "	" 26..	" 25..	121	41	"	3	14	24	56½
8	" "	" 26..	" 25..	121	40	"	3	13	32	57¾
9	" "	" 26 .	" 25..	121	38	"	3	15	44	56¾
10	" "	" 26..	" 25..	121	39	"	3	16	44	55¾
11	" "	" 26..	" 25..	121	40	"	2½	15	22	0
12	" "	" 26..	" 20..	116	42	"	3	14	32	0
13	Oats, Banner............	" 26..	" 20..	116	34	"	8	35	22	43½
14	Barley, Mensury	" 26..	" 13..	109	33	"	1¾	19	24	53
15	Wheat, Red Fife.	" 26..	" 25 .	121	37	"	2½	8	28	60
16	Barley, Mensury.........	" 16 .	" 13..	109	32	"	2¼	18	28	52¾
17	Red Clover......	May 25..	....	Ploughed under August 11						
18	Peas....................	" 11..	....	" July 29.						
19	Tares....................	" 11..	....	" July 29.						
20	Alsike	" 25..	....	" July 23.						
21	Alfalfa	" 24..	....	" August 11.						
22	Fallow	....	....							

SUMMARY OF RESULTS OBTAINED FROM EXPERIMENTS IN CROP ROTATION AT INDIAN HEAD, 1899-1909.

As rotation work in connection with field crops at the Indian Head Farm is now being introduced on a much larger scale it is not thought necessary to continue experiments on the smaller plots, and the following summary of the results obtained on the latter has been made.

In 1899, eleven acres of summer-fallowed clay loam were blocked out in plots of ½ acre each and marked by permanent stakes at the corners.

The main object in view in this arrangement was to ascertain what advantage, if any, would arise from the use of leguminous plants for ploughing under every third year in place of the usual summer-fallow. The leguminous plants were to be turned under in each instance at the time they reached their heaviest growth.

The Red Clover was sown in the proportion of 12 pounds per acre and the mixed clovers in the proportion of 8 pounds of Alfalfa and 6 pounds of Alsike per acre. The Soja beans were sown in rows 14 inches apart, using 60 lbs. of seed per acre.

Plots 11, 12, 13, 14, give tests of grain growing with summer-fallow and 15 and 16 of growing a grain crop every year. The good results obtained from these two plots should not be taken as an argument in favour of continuous cropping. Such returns are only possible on comparatively new land and are obtained at the cost of the exhaustion of the fertility of the soil.

It will be seen that, in the course of these experiments, where the growing of grain has been continuous, the crop has on the average been reduced. Some exceptions to this will be found which may probably be accounted for by the more favourable character of the season.

ROTATION OF CROPS—Plan inaugurated in 1899 for a Rotation of Crops.

No.	1899.	1900.	1901.	1902.
1	Wheat	Oats	Soja Beans	Wheat
2	Wheat	Wheat	Peas	Wheat
3	Wheat	Oats	Tares	Wheat
4	Wheat	Wheat	Red Clover	Wheat
5	Wheat	Barley	Alsike and Lucerne	Wheat
6	Peas	Wheat	Wheat	Peas
7	Tares	Wheat	Oats	Tares
8	Soja Beans	Wheat	Oats	Soja Beans
9	Red Clover	Wheat	Wheat	Red Clover
10	Alsike and Lucerne	Wheat	Barley	Alsike and Lucerne
11	Rape	Wheat	Summer-fallow	Rape
12	Wheat	Wheat	Summer-fallow	Wheat
13	Wheat	Oats	Summer-fallow	Wheat
14	Wheat	Barley	Summer-fallow	Wheat
15	Wheat	Wheat	Oats	Wheat
16	Wheat	Barley	Oats	Wheat
17	Oats	Soja Beans	Wheat	Oats
18	Wheat	Peas	Wheat	Wheat
19	Oats	Tares	Wheat	Oats
20	Wheat	Red Clover	Wheat	Wheat
21	Barley,	Alsike and Lucerne	Wheat	Barley
22	Rye	Summer-fallow	Wheat	Rye

The average and total yield of each variety of grain on each plot has been worked out for the number of years it has been sown and the revenue for each plot for the eleven-year period from 1899 to 1909 inclusive, found; wheat has been valued at 90 cents per bushel, oats at 40 cents, barley at 50 cents, rye at 75 cents and emmer at 1 cent per lb.

Any change made in the crops grown on a plot is noted in the table.

YIELDS PER ACRE.

No. of Plot	Variety.	1899.		1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907		1908.		1909.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Wheat Oats	36	6	11	2	Soja Beans		25	0	47	12	Soja Beans		33	20	55	30	Peas		31	16	62	—
2	Wheat	35	40	4	20	Peas		24	30	16	2	Peas		27	48	15	46	Tares		32	0	14	40
3	Wheat Oats	36	0	11	0	Tares		27	0	43	18	Tares		31	24	49	12	Alsike		30	36	42	26
4	Wheat	35	46	5	0	Red Clover		27	15	15	30	Red Clover		28	32	19	4	Red Clover		29	50	11	8
5	Wheat Barley	35	40	9	44	Clover		20	45	20	40	Alsike		28	51	25	2	Alfalfa		31	40	26	6
6	Wheat	Peas		16	50	38	52	Peas		24	8	31	28	Peas		21	36	17	34	Peas		12	16
7	Wheat Oats	Tares		19	30	97	32	Tares		24	28	70	24	Tares		20	36	62	6	Tares		14	24
8	Wheat Oats	Soja Beans		18	20	91	08	Soja Beans		22	58	47	28	Soja Beans		19	14	53	9	Alsike		13	32
9	Wheat	Red Clover		11	20	38	0	Red Clover		20	52	29	2	Red Clover		20	22	16	22	Red Clover		15	44
10	Wheat Barley	Alsike		8	20	50	36	Alsike		23	14	37	24	Alsike		21	46	26	0	Alfalfa		16	44
11	Wheat	Rape		10	40	Fallow		Rape		20	20	Fallow		Timothy		19	20	Fallow		35	42	15	22

YIELD PER ACRE—*Continued.*

No. of Plot.	Variety.	1899. Bush.	1899. Lbs.	1900. Bush.	1900. Lbs.	1901. Bush.	1901. Lbs.	1902. Bush.	1902. Lbs.	1903. Bush.	1903. Lbs.	1904. Bush.	1904. Lbs.	1905. Bush.	1905. Lbs.	1906. Bush.	1906. Lbs.	1907. Bush.	1907. Lbs.	1908. Bush.	1908. Lbs.	1909. Bush.	1909. Lbs.
12	Wheat	36	6	7	40	Fallow		18	45	14	16	Fallow		34	10	18	16	Fallow		36	32	14	32
13	Wheat	35	36					22	30					38	52					31	40		
	Oats			9	14					42	12					34	4					35	22
14	Wheat	35	40			Fallow		20	50			Fallow		32	54			Fallow		31	10		
	Barley			4	32					18	36					15	24					19	21
15	Wheat	36	0			Fallow		27	15			Fallow		32	46			Fallow		14	36		
	Wheat			4	30					15	40					13	20					8	28
	Oats					80	26					82	14					52	12				
16	Wheat	35	20	9	4			22	45					18	24								
	Barley									20	0					18	10			14	6	18	28
	Oats					98	8					50	20					61	26				
17	Oats	85	0					31	16					42	12					46	4		
				Soja Beans.						Soja Beans.						Alsike.						Red Clover.	
	Wheat					43	44					39	12					18	10				
18	Wheat	36	16					25	0					18	26								
				Peas.						Peas.						Peas.						Peas.	
	Wheat					43	18					36	8					15	56				
	Emmer																			1 284 lbs.			
19	Oats	86	24					32	26					52	18					52	2		
				Tares.						Tares.						Tares.						Tares.	
	Wheat					43	2					36	0					12	56				
20	Wheat	36	0					27	0					23	28					Cut green			
				Clover.						Clover.						Clover.						Alsike.	
	Wheat					42	16					32	6					23	18				
21	Barley	46	0					26	12					43	28					27	36		
				Clover.						Alsike						Alfalfa.						Alfalfa.	
	Wheat					43	12					28	54					12	24				
22	Rye	41	0					25	0													Fallow.	
				Fallow.						Fallow.						Fallow.							
	Wheat					44	40					36	0					23	6				
	Emmer													1,866 lbs.									
	Barley																			22	20		

COMPARISON OF REVENUE FROM EACH PLOT.

Number.	Variety.	Average Yield per Acre. Bush.	lbs.	Total Yield per Acre. Bush.	lbs.	Total Revenue per Acre. $ cts.	Total Revenue per Plot. $ cts.	—
1	Wheat 4 years	31	24	125	36	113 04	91 78	
	Oats 4 years	44	3	176	10	70 52		
	Soja Beans 2 years, Peas 1 year	.....	.....	.....	.....	.....	.....	Ploughed under.
2	Wheat 8 years	21	21	170	46	153 69	76 85	
	Peas 2 years, Tares 1 year	.....	.....	.....	.....	.....	.....	Ploughed under.
3	Wheat 4 years	31	15	125	0	112 50	85 58	
	Oats 4 years	36	23	146	22	58 66		
	Tares 2 years, Alsike 1 year	.....	.....	.....	.....	.....	.....	Ploughed under.
4	Wheat 8 years	21	31	172	5	154 88	77 44	
	Clover 3 "	.....	.....	.....	.....	.....	.....	Ploughed under.
5	Wheat 4 years	29	15	116	59	105 20	73 13	
	Barley 4 "	20	23	81	44	40 96		
	Clover 2 ", Alfalfa 1 "	.....	.....	.....	.....	.....	.....	Ploughed under.
6	Wheat 7 years	23	15	162	44	146 46	73 23	
	Peas 4 years	.....	.....	.....	.....	.....	.....	Ploughed under.
7	Wheat 4 years	19	45	78	58	71 07	81 70	
	Oats 3 years	76	32	230	28	92 33		
	Tares 4 "	.....	.....	.....	.....	.....	.....	Ploughed under.
8	Wheat 4 years	18	31	74	4	66 66	71 80	
	Oats 3 years	64	4	192	11	76 93		
	Soja Beans 3 years, Alsike 1 year	.....	.....	.....	.....	.....	.....	Ploughed under.
9	Wheat 7 years	21	40	151	42	136 53	68 27	
	Clover 4 "	.....	.....	.....	.....	.....	.....	Ploughed under.
10	Wheat 4 years	17	31	70	4	63 06	60 10	
	Barley 3 "	38	4	114	12	57 13		
	Alsike 3 ", Alfalfa 1 year	.....	.....	.....	.....	.....	.....	Ploughed under.
11	Wheat 5 years	20	17	101	24	91 26	45 63	
	Rape 2 years, Timothy 1 year, Fallow 3 years	.....	.....	.....	.....	.....	.....	Ploughed under.
12	Wheat 8 years	22	32	180	17	162 26	81 13	
	Fallow 3 "	.....	.....	.....	.....	.....	.....	Fallowed every third year.
13	Wheat 4 years	32	10	128	38	115 77	82 19	
	Oats 4 years	30	13	121	18	48 61		
	Fallow 3 years	.....	.....	.....	.....	.....	.....	Fallowed every third year.
14	Wheat 4 years	30	9	120	34	108 51	68 86	
	Barley 4 "	14	29	58	20	29 21		
	Fallow 3 "	.....	.....	.....	.....	.....	.....	Fallowed every third year.
15	Wheat 4 years	27	39	110	37	99 56		
	" 4 "	10	30	41	58	37 77	111 77	
	Oats 3 years	71	29	215	18	86 21		

COMPARISONS OF REVENUE FROM EACH PLOT—*Continued.*

Number.	Variety.	Average Yield per Acre.		Total Yield per Acre.		Total Revenue per Acre.		Total Revenue per Plot.		—
		Bush.	lbs.	Bush.	lbs.	$	cts.	$	cts.	
16	Wheat 4 years	22	39	90	35	81	53	99	35	
	Barley 4 "	16	23	65	42	32	94			
	Oats 3 years	70	6	210	20	84	24			
17	Oats 4 years	51	8	204	32	81	98	86	49	
	Wheat 3 "	33	42	101	6	90	99			
	Soja Beans 2 years } Clover 2 years }	.....	.....	.....	.....	.....	.....	.....	.....	Ploughed under.
18	Wheat 3 years	26	34	79	42	71	73	85	20	
	" 3 "	31	47	95	22	85	83			
	Emmer 1 year	.....	.....	..	1,284	12	84			
	Peas 4 years	.....	.....	.....	.....	.....	.....	.....	.....	Ploughed under.
19	Oats 4 years	56	1	224	2	89	61	86	49	
	Wheat 3 years	30	39	91	58	82	77			
	Tares 4 years	.....	.....	.....	.....	.....	.....	.....	.....	Ploughed under.
20	Wheat 3 years	28	49	86	28	77	82	82	86	
	" 3 "	32	33	97	40	87	90			
	Clover 4 "	.....	.....	.....	.....	.....	.....	.....	.....	Ploughed under.
21	Barley 4 years	35	43	143	28	71	80	73	93	
	Wheat 3 "	28	10	84	30	76	05			
	Clover 2 " } Alfalfa 2 " }	.....	.....	.....	.....	.....	.....	.....	.....	Ploughed under.
22	Rye 2 years	33	0	66	..	49	50	86	38	
	Wheat 3 years	34	35	103	46	93	39			
	Emmer 1 year	.....	.....	..	1,866	18	66			
	Barley 1 "	.....	.....	22	20	11	21			
	Fallow 4 years	.....	.....	.....	.....	.....	.....	.....	.....	Fallowed every third year.

EXPERIMENTS WITH FLAX.

Five varieties of flax were sown on May 17 on fallowed clay loam in one-twentieth acre plots and two sorts on larger plots—one on fallowed land and the other on Western Rye sod ploughed before sowing.

The seed was sown by grain drill at the rate of 40 lbs. per acre.

A quantity of the Dutch flax was pulled by hand, tied up in sheaves, and sent to the Canadian Flax Mills, Toronto.

FLAX—Test of Varieties.

Number.	Name of Variety.	Size.	Date of Ripening.	No. of days Maturing.	Average length of Straw, including Head.	Character of Straw.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
		Acres.			In.		Lbs.	Bush.	Lbs.	Lbs.
1	Common	....	Aug. 31.	106	24	Strong....	2,640	20	10	54½
2	White Flowering	....	" 24	99	26	" ...	3,280	18	32	55¼
3	Yellow Seeded	....	Sept. 3.	109	25	" ...	3,280	15	40	53¼
4	Riga	....	Aug. 28.	103	25	" ...	3,600	14	16	55
5	Improved Russian	....	" 27.	102	28	" ...	2,600	13	32	55
	Field Lots of Flax.									
	Dutch Flax (Fallow)	1·65	Aug. 24.	99	32	Strong....	......	18	0	55
	Common Flax (W. Rye sod)	3·30	" 25.	100	30	Thin.....	......	10	32	

GRASSES AND CLOVERS.

The season was very favourable for all the varieties of grasses and clovers grown in 1909.

CLOVERS.

All strains of alfalfa tested and Red Clover did exceedingly well, with no spots injured from any cause whatever.

As alfalfa has now stood for five years and Red Clover for three years, there is reason to hope that, with care in seeding, and by not cutting or pasturing too late in the fall, both of these valuable clovers may prove quite hardy for all portions of Saskatchewan.

It has been found from previous tests that a great deal depends on the first season's growth as to whether the clovers prove hardy or not. If they enter the first winter with small, short roots, they are almost sure to succumb, while if the roots have taken a firm hold and are sufficiently deep to be below the freezing and thawing line in the early spring, they are reasonably safe. If, added to this, the precaution is taken not to pasture too closely or too late in the fall, there is no reason to doubt their entire success.

The course pursued on the Farm which has given the best success is to plough stubble land late in May 4 or 5 inches deep; then harrow once. After harrowing, 10 to 12 lbs. of seed per acre is sown with a wheelbarrow grass-seeder. When sown, the land is harrowed, rolled and again harrowed. The rolling firms the soil and leaves the surface in good condition for the mower, and the last harrowing prevents evaporation.

The seed is sown without a nurse crop, and when the plants are sufficiently high, the mower is run close to the ground to kill weeds and cause the roots to take a better hold. This is repeated up to the end of July, and, after that, all growth is left for winter protection.

It has been found, when a nurse crop has been grown, that the plants are weakly, even if not badly killed out, by the grain using up all the moisture in August. If they survive after the grain is harvested, as a rule the weather is too dry for them to make satisfactory root or top growth, and they are not in a condition to stand the thaws and frosts of April and early May.

I give the results of growing alfalfa since 1904. In 1904, 1905 and 1906 the clovers were more or less pastured late in the fall. Since then, the stock are not allowed on the clover for any length of time.

RESULTS OF EXPERIMENTS IN GROWING ALFALFA PRODUCED FROM SEED OBTAINED FROM DIFFERENT SOURCES, ON DOMINION EXPERIMENTAL FARM, INDIAN HEAD.

In the spring of 1904, two strains of Alfalfa, Turkestan and Utah, were obtained from the Department of Agriculture, Regina, Sask., and one strain (Common) from The Steele, Briggs Seed Co., Toronto. All were sown on May 30 in half-acre plots.

All made a strong growth during that season. The mower was run over the plots twice, to check weeds and strengthen the roots.

All came through the winter and spring of 1904-5, and were cut for hay on July 15 and September 5, giving yields as follows: Turkestan, 4 tons, 840 lbs.; Utah, 4 tons, 80 lbs.; Common, 3 tons, 1,122 lbs. per acre.

In the spring of 1906, Utah Alfalfa was completely killed. Turkestan and Common were considerably injured, and the first cutting of both sorts was light. They were cut July 11 and September 7, and yielded: Turkestan, 2 tons, 260 lbs.; Common, 1 ton, 666 lbs. per acre.

In 1907, both plots were cut for hay on July 22, giving a yield of Turkestan, 1 ton, 1,163 lbs.; and of Common, 1 ton, 740 lbs. per acre. No second cutting was made, as the crop had been injured by the spring thawing and freezing, and in hopes of strengthening the roots, the second crop was left for protection.

In 1908, two cuttings were made, on July 4 and August 6, Turkestan giving 3 tons, 479 lbs.; and Common, 3 tons, 660 lbs. per acre.

In 1909, the cuttings were made on July 3 and August 18. In the first cutting, Turkestan yielded 1 ton, 1,270 lbs. of dry hay, and Common 1 ton, 980 lbs. per acre. The second cutting of both strains was put green into the silo for ensilage.

In 1905, the Department of Agriculture at Washington, D.C., sent nine strains of Alfalfa for testing. These were: Utah, Southern Montana, Commercial Seed, Minnesota (Grimm), Peru, New York, Samarkand (Turkestan), Nebraska and Northern Montana.

These were sown on May 18, on ½ or ¼-acre plots, the land having been fallowed the previous year. The mower was run over the plots twice, the clippings being left for winter protection. Late in the fall, cattle were pastured on the plots for a few days, as the growth was excessive.

RESULTS OBTAINED FROM THE VARIOUS STRAINS SINCE SEEDING.

Utah, Southern Montana, Commercial Seed, Peru and Northern Montana were entirely killed in the spring of 1906.

Minnesota (Grimm) came through perfectly and gave two cuttings in 1906.

New York, Samarkand and Nebraska were greatly injured, and the first cutting in 1906 was left on the ground.

The yields per acre for the four sorts have been:—

Minnesota (Grimm): 1906, 3 tons, 1,115 lbs.; 1907, cut for seed; 1908, 4 tons, 1,045 lbs.; 1909, 4 tons, 870 lbs.

New York: 1906, 2nd cutting, 1 ton, 1,523 lbs.; 1907, 3 tons; 1908, 4 tons, 1,832 lbs.; 1909, 1st cutting, 2 tons; 2nd crop put green into silo for ensilage.

Samarkand: 1906, 2nd cutting, 1 ton, 523 lbs.; 1907, 3 tons, 143 lbs. from 1st cutting, second growth left for protection; 1908, 4 tons, 654 lbs.; 1909, from 1st cutting, 1 ton, 1,910 lbs.; second crop put green into silo for ensilage.

Nebraska: 1906, 2nd cutting, 1 ton, 504 lbs.; 1907, 2 tons, 368 lbs. from 1st cutting, 2nd growth left for protection; 1908, 3 tons, 726 lbs.; 1909, 1 ton, 1,090 lbs. from 1st cutting, 2nd cutting put green into silo for ensilage.

STRAINS OF ALFALFA RECEIVED IN 1908.

In the spring of 1908, Grimm, Idaho, Montana, Dry Land and French Alfalfa were sent to the Experimental Farm for trial by Northrup, King & Co., Minneapolis, Minnesota. These, with some Turkestan Alfalfa from The Steele, Briggs Seed Co., Winnipeg, were sown on June 9, on fallow land. As in all other tests of alfalfa, the mower was used when the clovers were a few inches high, and the rest of the season's growth was allowed to remain for protection.

The yields per acre of the various strains for the season of 1909 were: Grimm, 2 tons, 1,398 lbs.; Idaho, 2 tons, 1,400 lbs.; Montana, 2 tons, 1,830 lbs.; Dry Land, 3 tons, 1,303 lbs.; French, 2 tons, 1,480 lbs.; Turkestan, 3 tons, 1,388 lbs.

STRAINS OF ALFALFA RECEIVED IN 1909.

In May last the following strains of Alfalfa were received from Mr. Chas. J Brand, of the Department of Agriculture, Washington, D.C. They were sown on May 25, on well-prepared fallowed land.

18629. Canadian.
20896. Vilmorin's Commercial Sand Lucerne.
21217. Lecoq's Commercial Sand Lucerne.
21232. Mongolian.
21247. Canadian.
21867. Nephi, Utah (Dry Land).
21938. Grimm-Excelsior, Minnesota.
21945. Sextorp, Nebraska (Dry Land).
22467. Alt-deutsche fränkische.
22636. Provence-Aubignan, France.
22834. Wessel, Duval Peruvian.
22946. Baltic, S. D., Wheeler's Selections.
23203. Werny or Tschilik Alfalfa, Northern Turkestan.
23396. Commercial German Sand Lucerne.
23454. Chinook, Montana.
23481. Leifman's Commercial Bohemian Sand Lucerne.
24367. Arabia.
24451. *Medicago ruthenica* from Siberia.
24454. *Medicago falcata* from Siberia.
25115. Commercial Sand Lucerne from Bromberg, West Prussia.
25167. Hardy Thuringian Alfalfa, Erfurt, Germany.
25176. Commercial Bohemian Sand Lucerne, from Wissinger, Berlin.
25179. Hungarian Lucerne, Boschan, Vienna.
25257. Pfalzer Luzerne, from Bavarian Palatinate.
25269. Frasinet, Roumania.
25270. Vasluiu, Roumania.
25271. Ohio-grown Alfalfa, Belfontaine.

All germinated evenly, and made a thick, even stand, with exception of *Medicago ruthenica* and *Medicago falcata*, which attained a height of only a few inches by the end of the growing season. The growth of the others was very rapid, and, for fear of lodging, all were cut on August 2, the second growth being left for winter protection.

In 1909, a number of strains of alfalfa were also received from Dr. Saunders, Director of Experimental Farms, Ottawa. These had been sent him by J. W. Westgate, of the Department of Agriculture, Washington, D.C.

The strains are as follows:

23454 Montana.
25102 Grimm.
24836 Canadian (purple flowers).
24837 Canadian (variegated flowers).
23394 Sand Lucerne.
25022 Old Frankish Lucerne.
24452. *Medicago falcata.*

These were sown with the other strains received direct from Washington, on May 25, and did equally well. They also were cut on August 2.

GRASSES AND RED CLOVER.

The Brome Grass (½-acre) was sown in 1899, and has been left to ascertain how long it will give fair returns.

The yields each year since sowing are given of the 4½ acres of Western Rye Grass, to show the decrease in yield.

The Western Rye and Red Clover sown in 1906 was cut twice this year. The first crop was half-and-half, and the last was entirely clover, part being left until the seed ripened. 136 lbs. clover seed was obtained from 3 acres, the balance being used for hay. An ordinary threshing machine was used in threshing the clover.

The Red Top and Timothy was sown as pure Red Top, but proved to be greatly mixed.

English Blue Grass is a promising variety, especially for the large quantity of pasture it affords after the hay is cut.

YIELDS AND DATES OF CUTTING.

Variety.	Year sown.	Size.	Date cut in 1909	Yield per Acre.	Remarks.
		Acres.		Tons. Lbs.	
Brome Grass	1899	½	July 20	1 1,040	Renewed by shallow ploughing in 1904.
Western Rye Grass and Red Clover	1906	7	" 9	2 100	1st. cutting.
" "		7	Oct. 2	1 1,000	2nd. cutting.
Red Top and Timothy	1908	½	July 6	2 250	
English Blue Grass	1908	½	" 6	2 960	
Red Clover	1908	½	" 6	1 1,463	1st. cutting.
"		½	Aug. 19	1 100	2nd. cutting.
Western Rye Grass	1906	4½	July 10	4 308	Yield in 1907.
" "	"	4½	" 16	2 1,536	" 1908.
" "	"	4½	" 7	1 1,925	" 1909.

INDIAN CORN.

Twenty-two varieties were grown, and all gave very satisfactory returns. The season was very warm, with abundance of rain, and with no frosts or set-backs of any sort. Several varieties were in the early milk stage when cut, which has only occurred once in previous years.

The land, a clay loam, was fallowed the preceding year, and 10 or 12 loads per acre of well-rotted manure applied after frost set in in November. Before sowing the corn, this was ploughed in, and well harrowed.

The corn was sown by grain drill on May 20 in rows 35 inches apart. The crop was cut on September 9, allowed to wilt on the ground two days, then drawn in, cut up and put into the silo. The yields were computed from the weight of 2 rows, each 66 feet long, after corn had wilted two days.

As will be seen, one variety—Patterson No. 1—was glazed when cut. This, without exception, was the earliest field corn ever grown on the Experimental Farm. Samples of this corn and of Patterson No. 2 were received for trial from the Manitoba *Free Press*.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Height.	Condition when Cut.	Weight per acre grown in Rows.		Weight per acre grown in Hills.	
		Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Eureka	114	Tasselled	20	1,140	16	120
2	Superior Fodder	108	"	19	1,820	19	610
3	Early Mastodon	111	In silk	19	1,600	14	1,920
4	Mercer	96	Early milk	19	1,160	..	....
5	North Dakota White	102	"	19	170	19	830
6	Longfellow	108	In silk	18	1,400	19	390
7	Wood's Northern Dent	111	"	18	410	18	190
8	Compton's Early	102	"	17	1,970	20	700
9	Angel of Midnight	96	"	17	1,310	19	390
10	North Dakota White (2)	96	"	17	1,200	..	....
11	North Western Dent	96	Early milk	17	1,090	..	....
12	Selected Leaming	111	In silk	17	540	16	1,110
13	Triumph	96	Early milk	17	540	.	....
14	Salzer's All Gold	114	Tasselled	16	1,550	17	210
15	Mammoth Cuban	96	In silk	16	1,440	16	890
16	Davidson	84	Early milk	16	1,330	..	....
17	Champion White Pearl	102	Tasselled	16	560	16	1,660
18	White Cap Yellow Dent	102	In silk	16	450	14	1,810
19	North Dakota Red	102	Early milk	14	1,260	..	....
20	Patterson No. 2	75	Late milk	13	730	..	...
21	Patterson No. 1	75	Glazed	12	420	..	....
22	North Dakota Yellow	87	Early milk	12	310	..	....

EXPERIMENTS WITH TURNIPS.

Twelve sorts of turnips were tested on fallowed clay loam, manured and prepared in the same manner as that on which the corn was sown. The drills were 30 inches apart, and the seed was sown on the flat.

All varieties were sown twice, and it will be seen that the early seeding gave the larger yield in all but four sorts.

A severe frost on September 13 froze the roots solid. They were drawn into the root cellar, and at this date (March 31) are being fed to the stock, but are not in as good condition as in other years.

The yields are computed from the weight of two rows, each 66 feet long.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	1st Plot sown.	2nd Plot sown.	1st Plot pulled.	2nd Plot pulled.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hartley's Bronze.....	May 15	May 26	Oct. 14	Oct. 14	30	852	1,014	12	28	1,420	957	00
2	Good Luck...........	" 15	" 26	" 14	" 14	29	344	972	24	25	1,216	853	36
3	Bangholm Selected...	" 15	" 26	" 14	" 14	27	1,044	917	24	24	1,632	827	12
4	Mammoth Clyde......	" 15	" 26	" 14	" 14	26	1,988	899	48	27	1,176	919	36
5	Halewood's Bronze Top..................	" 15	" 26	" 14	" 14	26	404	873	24	25	952	849	12
6	Kangaroo............	" 15	" 26	" 14	" 14	25	1,744	862	24	21	1,164	719	24
7	Magnum Bonum......	" 15	" 26	" 14	" 14	25	952	849	12	26	800	880	00
8	Jumbo	" 15	" 26	" 14	" 14	25	952	849	12	23	332	772	12
9	Carter's Elephant...	" 15	" 26	" 14	" 14	25	292	838	12	17	1,508	591	48
10	Hall's Westbury......	" 15	" 26	" 14	" 14	24	1,500	825	00	27	516	908	36
11	Skirving's	" 15	" 26	" 14	" 14	22	484	741	24	23	860	791	00
12	Perfection	" 15	" 26	" 14	" 14	20	1,844	697	24	19	808	646	48

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown on the same dates on a clay loam soil prepared in the same way as the turnip ground. The first seeding was destroyed as it came up by the Turnip fly, and was resown on June 14. The yields were computed from the product of two rows, each 66 feet long. The roots were pulled October 15.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Globe..........................	13	1,776	1,029	36	24	1,368	822	48
2	Half Sugar White..............................	27	1,572	926	12	22	220	737	00
3	Giant Yellow Intermediate......................	26	1,856	897	36	21	1 032	717	12
4	Prize Mammoth Long Red	25	1,876	864	36	21	1,560	726	00
5	Yellow Intermediate	24	1,500	825	00	23	1,256	787	36
6	Mammoth Red Intermediate	25	728	778	48	18	1,752	629	12
7	Selected Yellow Globe..............................	22	1,804	763	24	19	676	644	36
8	Perfection Mammoth Long Red...................	22	616	743	36	21	504	708	24
9	Gate Post..	21	1,296	721	36	11	1,892	398	12
10	Crimson Champion..............................	17	1,772	596	12	15	1,284	521	24

FIELD CARROTS.

Five varieties were tested on fallowed clay loam, manured and prepared the same as for the other roots. The yield was computed in the same way. Only one sowing was made on May 14 and the roots were pulled October 15.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.	
		Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	21	372	706	12
2	Mammoth White Intermediate	16	1,132	552	12
3	Half-Long Chantenay	14	1,040	484	
4	White Belgian	14	380	473	
5	Improved Short White	12	1,872	431	12

SUGAR BEETS.

Three varieties of sugar beets were sown on clay loam, two sowings being made of each variety, the first on May 26 and the second on June 14. They were grown more to ascertain their sugar-content than for their feeding qualities. The yields were computed as for the other roots. From the analysis made by Mr. F. T. Shutt, Chemist of the Experimental Farms, the sugar-content was about the average. The roots were all pulled October 15.

SUGAR BEETS—Test of Varieties.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.		Per cent Sugar in Juice.	Per cent Solids in Juice.	Co-efficient of Purity.
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	%	%	%
Klein Wanzleben	15	624	510	24	12	288	404	48	16·94	19·69	86.0
Vilmorin's Improved	14	248	470	48	11	1,100	385	00	17·25	19·89	86.7
French Very Rich	13	1,588	459	48	12	1,212	420	12	17·28	20·03	85.1

POTATOES.

The yield and quality of the potato crop in 1909 has never been surpassed on the Experimental Farm, and the yield throughout the province has never been approached. Unfortunately, large quantities were destroyed by the frost on September 13.

All the potatoes on the Experimental Farm were safely secured.

The yield per acre was computed from the weight of 2 rows, each 66 feet long, and 30 inches apart.

The tubers before planting were soaked for 2 hours in a solution of 1 lb. Formalin in 30 gallons of water. When dry, they were cut into sets with two eyes in each, planted on May 15, and dug on September 21.

The land was a clay loam fallowed, manured and prepared as for the other roots.

There was no injury from rot in any of the plots and the tubers were almost uniformly large.

Potatoes—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.	Number.	Name of Variety.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
1	American Wonder...	686	24	Long, white.	11	Vermont Gold Coin.	506		Oval, white.
2	Everett...........	649	00	" pink.	12	Rochester Rose.....	503	48	" red.
3	Dreer's Standard....	611	36	Oval, white.	13	State of Maine.....	499	24	" white.
4	Vick's Extra Early..	611	36	" pink.	14	Dalmeny Beauty ...	497	12	" "
5	Irish Cobbler.. . .	611	36	Long, pink.	15	Money Maker	486	12	Long, white.
6	Morgan Seedling....	609	24	" "	16	Carman No. 1.......	473		Oval, white.
7	Late Puritan... ...	602	48	Oval, white.	17	Ashleaf Kidney.....	464		Round, white.
8	Reeves' Rose........	583	00	" red.	18	Dooley.............	369	36	Oval, white.
9	Holborn Abundance.	550	00	Round, white.	19	Uncle Gideon's Quick Lunch......	350		" "
10	Empire State.	534	36	" "					

SUMMARY OF CROPS.

Wheat—

	Bushels.
7 varieties in field lots, 62·69 acres..	1,704·29
10 half-acre rotation test plots..	68·25
14 uniform test plots..	20
	1,792·54

Oats—

	Bushels.
6 varieties in field lots, 39·40 acres..	3,501·15
3 half-acre rotation test plots..	70·7
23 uniform test plots..	84·12
	3,655·97

Barley—

	Bushels.
7 varieties in field lots, 30·19 acres..	1,512·41
3 half-acre rotation test plots..	32·41
21 uniform test plots..	49·17
	1,593·99

Peas—

	Bushels.
4 varieties in field lots, 6·68 acres..	373·15
21 uniform test plots..	37·4
	410·55

	Bushels.
Flax..	35
Fall Rye..	24
Potatoes..	200
Roots..	3,000

	Tons
Corn Ensilage	60
Hay—	
	Tons.
Western Rye Grass and Red Clover	15
Western Rye Grass	21
Alfalfa	12
Other cultivated grasses	4½
Cut in coulées	20
	72½

VEGETABLES.

In no previous year were vegetables so abundant and of such good quality as last year over the whole province. On the Experimental Farm, all varieties sown gave large yields.

Beans and Tomatoes, which very often suffer from early frost, matured without injury from any cause.

ASPARAGUS.

In use from May 28 to July 20. A good crop was obtained from the old beds of Barr's Mammoth, Barr's Elmira and Conover's Colossal.

Beans—Sown May 19 and 20.

Variety.	In use.	Pulled.	Remarks.
Haricot Matchless	July 28	Sept. 6	Long green.
Black Speckled	Aug. 3	" 6	"
White Field	" 5	" 2	Small green.
French Unrivalled	July 28	" 3	
Early Six Weeks	" 25	" 7	Long green.
Black Butter XXX	" 28	" 2	
Emperor of Russia	" 27	" 4	Short green.
Dwarf Wax	" 26	" 4	Long wax.
French Extra Early	" 25	" 3	Medium wax.
Haricot Extra Early	" 26	" 7	Long wax.
Dwarf Kidney	" 26	" 4	
Haricot Matchless	" 26	" 10	Rusted slightly.
French Dwarf Extra Early	" 25	" 2	
Dwarf Wax	" 26	" 8	"
Emperor of Russia	" 25	" 9	
Fame of Vitry	Aug. 2	" 10	
Challenge Black	July 25	" 4	
Extra Early	" 25	" 1	"
Honey Pod	" 25	" 9	Rusted.
Bush Green Pod	" 25	" 9	
White Field	Aug. 9	" 7	

Beets—Sown May 14; Pulled October 14.

Variety.	In Use.	Yield per Acre.
		Bush.
Half Blood Red	July 14	1,033
Egyptian Dark Red	" 14	850
Nutting's Dwarf Improved	" 14	716
Detroit Dark Red	" 17	666

CABBAGE.

Variety.	In use.	Average weight.
		Lbs.
Early Cabbage—Sown in hot-house April 3. Set out May 19.		
Early Midsummer	July 15	6
Early Paris Market	" 1	7
Early Jersey Wakefield	" 18	6
Paris Market	" 6	6
Late Cabbage—Sown in hot-house April 3. Set out May 22. Pulled Oct. 14.		
Large Red Drumhead	Aug. 10	19
Kildonan	" 17	17
Volga or Russian	" 6	17
Brill's Nonsuch	" 6	16
Early Long Island	" 7	16
Fottler's Improved Brunswick	" 4	17
World Beater	" 12	17
All Seasons	" 15	16
Chester King	" 19	15
Autumn	" 20	20
Late Cabbage. 2nd Seeding. Sown in hot-house April 12. Set out May 26.		
Large Red Drumhead	" 25	17
World Beater	" 15	19
All Seasons	" 21	14
Kildonan	" 21	16
Volga	" 21	16

CAULIFLOWER—Sown in hot-house April 3; set out May 19.

Variety.	In use.	Average weight.
		Lbs.
Earliest Snowball	July 14	6
Henderson's	" 14	6
Selected Earliest	" 3	7
Early Snowball (C.E.F.)	" 3	8
Extra Early Whitehead	" 3	8

CARROTS—Sown May 10; taken up October 9.

Variety.	In use.	Yield per acre.
		Bush.
Chantenay	July 23	716
Half-long Danvers (North Dakota)	" 20	650
Half-long Danvers (from Canadian Seedsman)	" 21	633
Ox Heart	" 20	566
Improved Red	" 20	516
Improved Nantes	" 20	416
Half-long Scarlet Nantes	" 19	416
Early Scarlet Horn	" 18	400
French Horn	" 20	333

CUCUMBERS—Sown in hot-house April 3; set out May 26.

Variety.	In use.	Average length.
		Inch.
Giant Pera	July 27	12
Improved Long Green	" 25	11
Short Green	" 28	6
Long Green	" 26	12

TABLE CORN—Sown May 20.

Variety.	In Use, green.	Ripe.
Extra Early Adams	Aug. 29	None matured for seed.
Peep O'Day	" 24	" "
Earliest Catawba	Sept. 5	" "
Early White Cob	" 1	" "
Golden Bantam	" 5	" "
Early Fordhook	" 10	" "
White Squaw	Aug. 15	Sept. 20.
Red Squaw	" 17	" 20.
Kansas Soldier	Sept. 5	Did not mature for seed.

CELERY—Sown in hot-house April 3; Set out June 4.

Variety.	In use.	Weight of 1 dozen.
		Lbs.
White Plume	Aug. 21	15
Giant Pascal (C. E. F.)	Sept. 1	20
Giant White	" 1	19
Rose-ribbed	" 1	10
Dwarf White Solid	" 1	9
Paris Golden Yellow	" 1	10
Celeriac	" 1	9

CITRONS.

Sown in hot-house April 12; set out in garden May 26. Ready for use September 14. A good size, but not many set.

LETTUCE.

Variety.	In use.
Sown in Cold Frame, April 21.	
Big Boston	June 5.
Neapolitan	" 5.
Cos Trianon	" 7.
Tom Thumb	" 7.
1st Seeding in open, May 3.	
Cos Trianon	" 15
Tom Thumb	" 15.
Neapolitan	" 20.
Big Boston	" 15.
All the Year Round	" 15.
2nd Seeding in open, May 22.	
Cos Trianon	" 24.
Neapolitan	" 26.
Wheeler's Tom Thumb	" 26.
Nonpareil	" 24.
3rd Seeding in open, June 4.	
Cos Trianon	July 8.
Neapolitan	" 8.
Nonpareil	" 7.
Tom Thumb	" 10.
All the Year Round	" 12.

MUSK MELON.

Sown in hot-house April 12; set out May 28; None matured.

ONIONS—Sown in hot-house April 15; transplanted to garden May 20. Pulled September 23.

Variety.	Bushels per acre.
Paris Silverskin	416
Prizetaker	333
Yellow Globe	316
Red Wonder	316
Large Red Wethersfield	316
Danvers' Yellow Globe	216
Sown in open, May 6, pulled September 23,	
Prizetaker	300
Paris Silverskin	300
Red Wonder	283
Danvers' Yellow Globe	266
Large Red Wethersfield	266
Round Yellow Danvers	216
Red Wethersfield	200

An exceptionally fine crop of all varieties. Very even in size, with no small bulbs.

PARSNIPS—Sown May 10; Dug October 16.

Variety.	In use.	Bushels per acre.
Guernsey	July 30	450
The Student	" 30	450
Elcomb's Giant	Aug. 6	383

Parsley.

Curled Leaf, sown May 14; in use July 10; of good quality.

Garden Peas—Sown May 11.

Variety.	In use.	Ripe.
American Wonder	July 29	Aug. 25.
Shropshire Hero	" 27	" 25.
Laxton's Charmer	" 26	" 25.
Yorkshire Hero	" 29	Sept. 1.
Surprise	" 27	" 1.
Nott's Excelsior	" 26	" 1.
Burpee's Profusion	" 29	" 1.
Anticipation	" 28	" 1.
Leviathan	" 14	Aug. 20.
Perfection	" 28	Sept. 1.
Queen	Aug. 4	" 1.
Gradus	July 16	Aug. 20.
Dwarf Telephone	" 29	Sept. 1.
Stratagem	Aug. 1	" 1.
Rennie's Queen	July 28	" 1.
Admiral	" 26	Aug. 25.
Alaska	" 26	" 20.
Horsford's Market Garden	" 28	" 25.
Western Beauty	" 21	" 25.

Pumpkins—Sown in hot-house April 3; Set out May 26.

Variety.	Ready for use.	Ripe.	Average weight.
			Lbs.
Connecticut Field	Aug. 10	Sept. 15	15
Large Etampes	" 15	" 15	45
Large Cheese	" 10	" 15	20
Large Yellow Globe	" 10	" 15	75

Radishes.

Three seedings of radishes were made. Those sown on May 8 were ready to use June 15; sown May 22, in use June 24 and sown June 7, in use July 5. The varieties sown were—White-tipped, Early Scarlet, Olive Scarlet and Forcing Turnip, the last sort being hardly as good as the other three

Rhubarb.

The old beds of rhubarb were in use from June 1 to September 18, giving an extra good crop.

Rhubarb seed was sown on May 28, to produce young plants for the following spring's distribution.

Spinach.

Two sorts, Victoria and Savoy-leaved, were sown on May 14; in use June 22 to July 5. A very good crop.

TOMATOES.

Sown in boxes in the house March 9 and 20; transplanted to pots in hot-house April 5; set out in garden May 25. The yield is the number of pounds of fruit both green and ripe taken on September 6 from three plants set three feet apart.

Variety.	Sown.	First ripe.	Yield of 3 plants.
New Earliana	March 20	July 29	51 lbs.
Spark's Earliana (C.E.F.)	" 20	" 29	36 "
Early Ruby	" 9	Aug. 10	30 "
Earliest of All	" 9	" 6	30 "
Early Jewel	" 20	" 16	24 "
Livingstone Globe	" 20	" 16	22 "

Tomato seeds were also sown in the hot-house on April 3, and set out in the garden on May 27. The yields are for the same number of plants at the same distance apart as the earlier sown plants, but were pulled September 18.

Variety.	First ripe.	Yield of 3 plants.
Spark's Earliana (C. E. F.)	Aug. 31	33 lbs.
Earliest of All	Sept. 1	27 "
Spark's Earliest (Burpee)	" 1	24 "
Early Ruby	" 2	24 "
Early Jewel	" 4	21 "

SQUASH—Sown in hot-house April 12; set out in garden May 26.

Variety.	Ready for Use.	Remarks.
Giant Crookneck	July 23	Large, good crop.
Custard Marrow	" 22	" "
Mammoth Whale	" 29	" "
Long White Bush	" 20	" "
Hubbard	" 31	" "
Custard Orange	" 28	" "
Custard	" 29	" "
White Congo	" 30	" "
Early Orange	" 27	" "
Long Vegetable Marrow	" 20	" "

SAGE.

Sown May 14; ready for use July 15; a good crop.

FRUITS.

The fruit crop was abundant over the province and nearly all sorts on the Experimental Farm gave large yields.

Many of the crab apple trees were loaded down; the wild plum trees also gave a fair crop.

Part of Flower Garden, Experimental Farm, Indian Head, Sask.

16—p. 408.

Part of Vegetable Garden, Experimental Farm, Indian Head, Sask.

16 p. 408

Currants and gooseberry bushes were well loaded, but the currant fly did considerable injury, causing much of the fruit to dry up and fall.

Raspberry bushes gave a very large crop, and strawberries a fairly good one. A list of small fruits on the Farm is given.

RED CURRANTS.

Victoria,
Manitoba Amber,
London Red,
Early Scarlet,
Prince Albert,
Wilder,
Simcoe King,
Large Red,
North Star,
Red Grape,
La Conde,
Fay's Prolific,
Houghton Castle,
Raby Castle,
Rankin's Red,
Cherry,
Fertile D'Angers,
London Red,
New Red Dutch,
Victoria Red,
Long Bunch Holland,
La Conde,
Moore's Early,
Large Red,
Greenfield,
Benwell,
Cumberland Red,
Red English.

WHITE CURRANTS.

Frauendorfer White,
Climax,
White Imperial,
White Dutch,
White Kaiser,
White Cherry,
White Pearl,
Verrier's White,
Large White,
White Grape,
Large White Brandenburg,
Wentworth Leviathan.

BLACK CURRANTS.

Eclipse,
Stirling,
Black English
Gewohnliche,
Stewart,
Dominion,
Success,
Beauty,
Clipper,
Perry,
Ethel,
Star,
Crandall's Missouri,
Ogden,
Mattie,
Black Grape,
Merveille de la Gironde,
Standard,
Perth,
Oxford,
Ismay's Prolific,
Lewis,
Star,
Saunders,
Topsy,
Kerry,
Magnus,
Beauty,
Eagle,
Ethel,
Lee's Prolific,
Climax.

RED AND BLACK RASPBERRIES.

Columbia,
Cuthbert,
Marlboro,
Schaffer (purple),
Older (black),
Golden Queen (yellow),
Ruby Red,
Hilborn Black Cap,

RED AND BLACK RASPBERRIES—*Continued.*

Conrath (black),
Palmer (black),
King,
Cardinal,
Munger's (black),
Sunbeam,
Herbert,
Dr. Reider,
Turner.

GOOSEBERRIES.

Industry,
Downing,
Houghton's Seedling,
Companion,
Troy,
Cluster,
Ruth,
Governess,
Smith's Improved,
Edna,
Mabel,
Gibb,
Saunders,
York,
Griffin,
Sussex,
Rideau,
Sandow,
Merton,
Red Jacket.

STRAWBERRIES.

Senator Dunlap,
S. Dakota No. 1,
S. Dakota No. 2.

BLACKBERRIES.

Eldorado,
Mersereau,
Ancient Briton.

CROSS-BRED APPLES.

When picking the crop of cross-bred apples, a record was kept of the weight of fruit gathered from some of the best trees, and is given below. The date of picking was September 15.

Orchard.	Row.	No.	Name.	Year Planted.	Year began Fruiting.	Weight of Fruit in 1909.	Average Diameter
						Lbs.	Inches.
IV...	3	5	Cavan	1901	1904	155	$1\frac{1}{2}$
IV...	3	6	"	1901	1904	80	$1\frac{1}{3}$
IV...	3	13	Pyrus Baccata x Tetofsky No. 45	1901	1904	56	$1\frac{3}{8}$
IV...	4	11	Aurora	1903	1907	106	$1\frac{1}{4}$
IV...	4	12	"	1903	1907	148	$1\frac{1}{4}$
IV...	4	13	"	1903	1907	58	$1\frac{1}{4}$
IV...	4	14	"	1903	1907	38	$1\frac{1}{4}$
IV...	4	17	No. 116	1901	1907	52	$1\frac{1}{4}$
IV...	5	1	Charles	1903	1909	71	$1\frac{1}{2}$
IV...	5	2	"	1903	1907	48	$1\frac{1}{4}$
IV...	5	3	"	1903	1908	40	$1\frac{1}{4}$
IV...	5	4	"	1903	1907	60	$1\frac{1}{2}$
IV...	5	9	Derby	1903	1907	100	$1\frac{1}{8}$
IV...	5	13	Pioneer	1903	1907	48	$1\frac{1}{8}$
VII...	8	18	Prince	1905	1909	16	$1\frac{1}{2}$

SEEDLING PLUMS.

All the varieties, 17 in number, of seedling plums obtained from the Experimental Station at Brookings, S. Dakota, in 1908, came through the winter safely. Two of the varieties fruited to a small extent, but did not fully ripen.

FRUIT TREES AND BUSHES PLANTED, 1909.

CROSS-BRED APPLES.

From E. D. Smith, Winona, Ont.

25 Prince,
35 Magnus,
20 Tony,
5 Bow,
25 Pioneer,
20 Sylvia
40 Jewel,
10 Elsa,
20 Dawn,
30 Golden,
10 Carleton,
10 Eve,
10 Osman,
10 Charles,
30 Alberta.

RASPBERRY AND BLACKBERRY BUSHES.

From the Central Experimental Farm, Ottawa.

20 Early King Raspberry,
20 Schaffer's Colossal,
20 Snyder Blackberry,
12 Eldorado Blackberry,
20 Kansas Black Cap.

FLOWERS.

The season for flowers was exceptionally favourable and the bloom has not often been as profuse as it was last year.

ANNUALS.

Variety.	Sown in Hothouse.	Transplanted.	In Bloom From	In Bloom To
Antirrhinum	April 5	May 31	July 14	October 8
Asters, 13 varieties	" 3	" 27	" 14	" 8
Balsams	" 3	" 25	" 11	" 8
Candytuft	" 5	" 28	" 19	" 8
Dianthus, 5 varieties	" 5	" 31	" 7	" 8
Gaillardia picta	" 6	" 31	" 7	" 8
Mignonette	" 5	June 5	" 24	" 8
Nasturtium	" 3	May 11	June 21	" 8
Nicotiana affinis	" 5	June 5	" 24	" 8
Pansy, 10 varieties	" 5	" 31	July 2	" 9
Petunias	" 3	" 31	" 1	" 9
Phlox, 3 varieties	" 3	" 31	" 2	" 9
Portulaca	" 3	" 31	" 2	" 9
Salpiglossis	" 5	" 15	" 29	" 9
Stocks (10 weeks)	" 3	" 15	Aug. 3	" 9
Verbena	" 3	" 31	July 14	" 9
Zinnia	" 12	" 29	" 1	" 9

ANNUALS—Sown in Open Garden on May 15.

Variety.	Sown.	In Bloom	
		From	To
Abronia umbellata	May 15	Aug. 17	October 8
Antirrhinum	" 15	July 19	" 8
Brachycome	" 15	" 26	" 8
Bartonia	" 15	" 15	" 8
Calendula	" 15	" 15	" 8
Clarkia	" 15	" 25	" 8
Coreopsis	" 15	" 24	" 8
Candytuft	" 15	June 19	" 8
Godetia	" 15	Aug. 3	" 8
Helichrysum	" 15	July 31	" 8
Iceland Poppy	" 15	June 7	" 8
Mignonette	" 15	July 15	" 8
Nasturtium	" 15	" 20	" 8
Pansies	" 15	" 15	" 8
Scabiosa	" 15	Aug. 17	" 8
Salpiglossis	" 15	July 27	" 8
Single Red Poppy	" 15	June 7	" 8
White Feathered Poppy	" 15	" 27	" 8
Sweet Peas (27 varieties)	April 5	" 19	" 8

PERENNIALS.

Variety.	In Bloom	
	From	To
Achillea Millefolium	July 3	Oct. 8
Achillea Ptarmica	" 3	" 8
Blue Squills	May 18	June 1
Bleeding Heart	June 10	July 28
Columbine	" 15	" 24
Comfrey	July 2	Aug. 23
Carnations	" 10	Oct. 6
Clematis, Blue	" 11	" 7
Clematis recta	" 1	Aug. 9
Campanula	" 19	Sept. 20
Centaurea, Yellow	" 21	Aug. 25
Clematis	" 7	Oct. 8
Centaurea	June 19	July 15
Everlasting	" 10	June 29
German Iris	" 9	" 29
Golden Glow	Aug. 5	Oct. 8
Gladioli	" 7	" 7
Helianthus (Sunflower)	July 26	" 8
Hemerocallis	" 27	Sept. 4
Iris Siberica	June 12	July 8
Japanese Paeonies	July 11	Aug. 14
Larkspur	" 9	Sept. 1
Lilies (Several Kinds)	" 13	Oct. 28
Lupinus Polyphyllus	" 14	Aug. 23
Lily of the Valley	June 10	June 16
Oriental Poppy	July 5	July 24
Paeony (Tenuifolia)	" 10	June 29
Paeonies (Assorted Varieties)	" 29	July 30
Phlox (Perennial)	Aug. 6	Oct. 8
Pyrethrum	Sept. 23	" 12
Perennial Asters	" 23	" 12
Sweet William	June 29	" 8
Sidalcea candida	July 5	Aug. 25
Spirea Filipendula	" 7	" 7
Shasta Daisy	" 7	Sept. 1
Sunflowers (tall annual)	Aug. 10	" 10
Tulips	May 25	June 26
Tall Lychnis (Maltese Cross)	July 5	Sept. 12
Tall White Iris	" 26	Aug. 5
Veronica Spicata	" 11	" 14

FLOWERING SHRUBS.

Last year was an exceptionally fine season for all flowering shrubs, and those on the Farm surpassed all former years. This was notably the case with the lilacs, which were very beautiful indeed, no less than 24 varieties being in bloom during the season. The following is a list of shrubs and dates while in bloom:—

Variety.	In Bloom. From.	In Bloom. To.	Variety.	In Bloom. From	In Bloom. To
Lilacs.			*Lilacs.—Con.*		
Mons. Maxime Cornu	June 5.	July 20.	Michael Buchner	June 5.	July 20
Rubella Plena	" 5	" 23.	Villosa	" 18.	" 30
Condorcet	" 7.	" 23.	Vulgaris grandiflora	" 5.	" 23
La Tour d'Auvergne	" 7.	" 23.			
Mathieu de Dombasle	" 8.	" 23.	*Other varieties of Shrubs.*		
De Marley	" 5.	" 21.			
President Grevy	" 5.	" 23.	Golden Currant	June 5.	June 17
Lemoine	" 7.	" 24.	Viburnum Lantana	" 8.	" 21
Persian Lilac	" 11.	" 9.	American Elder	" 8.	" 21
Madame Casimir Perier	" 5.	" 23.	Saskatoon Berry	" 5.	" 11
Chas Joly	" 7.	" 23.	Hawthorn	" 8.	" 21
Francisque	" 5.	" 20.	Caragana (6 Varieties)	" 10.	" 25
Congo	" 6.	" 22.	Cytisus Capitatus	" 10.	" 30
Mme. Legraye	" 5.	" 23.	Japanese Quince	" 10.	July 12
Abel Carriere	" 7.	" 20.	Dogwood (Cornus)	" 10.	" 9
Madam Lemoine	" 8.	" 24.	High bush Cranberry	" 17.	" 2
Alphonse Lavallée	" 8.	" 23.	Berberis	" 19.	" 2
Emodi	" 5.	" 20.	Roses (single varieties)	" 19.	Oct. 9
Virginité	" 6.	" 22.	Spirea (4 Varieties)	" 19.	July 6
Josikea	" 8.	" 29.	Virburnum	" 20.	June 30
Chas X	" 5.	" 23.	Mountain Ash	" 14.	" 26

TREES AND SHRUBS PLANTED.

The following trees and shrubs were sent up in May last from the Central Experimental Farm, Ottawa, and planted out:—

2 *Neillia Torreyi.*
2 *Cimicifuga racemosa*
100 *Spiræa Van Houttei.*
100 *Lonicera grandiflora rosea.*
2 *Rhus glabra.*
2 *Rhus glabra laciniata.*
2 *Rhus aromatica.*
2 *Rhus typhina.*
1 *Rhus typhina laciniata.*
2 *Rhurs Cotinus.*
2 *Rhus Cotinus atropurpurea.*
100 *Rosa rugosa.*
2 *Caragana ambigua.*
2 *Caragana Chamlagu.*
2 *Salix elegantissima.*
2 *Salix glabra phylicifolia.*
1 *Populus heterophyllus.*
2 *Populus Wobstii.*
1 *Populus Charkovensis.*
2 *Robinia viscosa.*
2 *Hypericum van Fleeti.*
2 *Phelodendron amurense.*
2 *Amelanchier Utahense.*
1 *Spiræa Menziesii triumphans.*
2 *Spiræa betulifolia superbo*

EXCURSIONS TO THE EXPERIMENTAL FARM.

The Department of Agriculture, Regina, ran excursions last year on July 23 and 24 to the Experimental Farm from all points along the Soo and Estevan line, the

Regina and Arcola line and on the main line west to Moosejaw from the eastern boundary of the province. Over three thousand came by train on the two days and very large numbers drove in from the surrounding districts.

The Hon. W. R. Motherwell, Minister of Agriculture, President Murray and Prof. Rutherford, of the University and Agricultural College, Saskatoon, gave acceptable addresses on both days.

The Lady Directors of the Hospital provided a lunch for the visitors. A sufficient number of comfortable conveyances were provided, and all visitors were able to drive about the Farm. Everything passed off satisfactorily, and no injury was done by the great throng that visited every part of the Farm.

PREPARING LAND FOR GRAIN CROPS IN SASKATCHEWAN.

During the growing season of 1908, almost the entire western portion of the province suffered from dry weather, and the majority of the new settlers, either from unfamiliarity with the methods of cultivation for the conservation of moisture, or through a desire to bring the greatest possible area under cultivation, naturally suffered a severe disappointment.

In some districts, where in former years moisture had been abundant and proper cultivation had in consequence been neglected in the effort 'to get rich quick,' the partial failure of the crop proved an expensive lesson.

For many years, commencing in 1888, the methods of conserving moisture by 'breaking and backsetting' and by 'summer-fallowing'—now called 'dry-farming' for a change—have been recommended and universally adopted by the older settlers but to very many of the new settlers they are unknown. The latter, I trust, may be benefited by the following explanation of the methods which, for a great many years, have proved uniformly successful for every district in the province of Saskatchewan.

BREAKING PRAIRIE SOD.

The success or failure of a new settler often depends on the method employed in the preparation of the land for his first crop, and it is, therefore, of the utmost importance that the question of 'breaking' or 'breaking and backsetting' be given the consideration it deserves.

For some years past, the general practice throughout the country has been to continue breaking three or more inches deep so long as the teams can turn over the sod; then, in the fall, to disc the topsoil, and sow grain on the spring following. From the breaking so done before the end of June, a good crop of wheat, oats or barley is usually obtained, but no amount of cultivation will ensure even a fair crop on this land in the next succeeding year. After the first crop has been cut the soil is usually in a perfectly dry state, and remains so, in spite of any known method of cultivation, until the rains come in the following spring. If they are insufficient or late, as is frequently the case, failure of the crop must be the result.

BREAKING AND BACKSETTING.

Breaking and backsetting is the true way of laying the foundation of future success in the greater number of districts throughout the province, and while this method does not permit of as large an acreage being brought under cultivation in a year, it does permit of more thorough work and ensures better results in the long run. The anxiety of nearly all settlers to sow every acre possible, regardless of how or when the work on the land has been accomplished, may be given as the reason for breaking and discing to a large extent superseding the older, better and safer plan.

Breaking and backsetting means the ploughing of the prairie sod as shallow as possible before the June or early July rains are over, and, in August or September, when the sod will have become thoroughly rotted by the rains and hot sun, ploughing two or three inches deeper in the same direction, and then harrowing to make a fine and firm seed-bed. From land prepared in this way, two good crops of wheat may be expected. The first crop will be heavy, and the stubble, if cut high at harvest time, will retain sufficient snow to produce the moisture required, even in the driest spring, to germinate the seed for the next crop. The stubble land can readily be burned on a day in the spring with a hot, steady wind, and the seed may be sown with or without further cultivation. In a case where the grass roots have not been entirely killed by the backsetting, a shallow cultivation before seeding will be found advantageous, but as a rule the harrowing of the land with a drag-harrow after seeding will be sufficient.

The principal objection to breaking and backsetting is urged with regard to the backsetting, which is, no doubt, heavy work for the teams, but, if the discing required to reduce deep breaking, and afterwards the ploughing or other cultivation that must be done in an effort to obtain a second crop be taken into consideration, it must be conceded that in the end 'breaking and backsetting' is the better method.

When two crops have been taken from new land it should be summer-fallowed.

SUMMER-FALLOWS AND SUMMER-FALLOWING.

Among the many advantages to the credit of the practice of summer-fallowing may be mentioned: the conservation of moisture, the eradication of weeds, the preparation of land for grain crops when no other work is pressing, the availability of summer-fallowed land for seeding at the earliest possible date in the spring, and the minor advantages of having suitable land for the growing of pure seed, potatoes, roots and vegetables at the least cost and with the greatest chance for success, and that of being able to secure two crops of grain with little or no further cultivation.

Summer-fallowing has undoubtedly some disadvantages, but so long as the growing of grain, and more particularly wheat, remains the principal industry of the province, it will be necessary to store up moisture against a possible dry season, to restrain the weeds from over-running the land, and, on account of the short seasons, to prepare at least a portion of the land to be cropped, in the year previous to seeding. A well-made summer-fallow is the best means to this end. Among the disadvantages are: the liability of the soil to drift, the over-production of straw in a wet season (causing late maturity and consequent danger of damage by frost), and, it is claimed, the exhaustion of the soil. The two former may, to a great extent, be overcome by different methods of cultivation, and, if the soil can be prevented from drifting, I am satisfied that one of the reasons for the latter contention will disappear.

Various methods are practised in the preparation of fallow, and where the aim has been to take advantage of the June and July rains and to prevent the growth of weeds, success is almost assured. Where the object has been to spend as little time as possible on the work, failure is equally certain.

In my annual report of 1889, the following was submitted for the consideration of the settlers. Since then many experiments have been conducted on the Experimental Farm with different systems, and again I submit what, on the whole, have been found to be the most successful methods for the cultivation of the soil in Saskatchewan.

FROM REPORT OF 1889 (DECEMBER 29).

'The year just past has been one of extremes; last winter was one of the mildest on record, and March was so very fine that thousands of acres of grain were seeded from the 15th to the 31st, and at no time in the history of the country has the ground been in better condition for the reception of the seed. Immediately after seeding, however, exceptionally high winds set in, followed by extreme drought during the entire

growing season. In many places the crops were injured by the winds, and finally almost ruined by the succeeding dry weather. In some localities, however, where the farming had been done in accordance with the requirements of the country, the crops did fairly, and considering the excessively dry weather, remarkably well.

'The Experimental Farm suffered in company with every other farm in the country. Perhaps very few suffered as much from winds, but the dry weather, though reducing the yields, did not prove as disastrous as to many others. In this portion of the Territories at least, every settler knows the importance of properly preparing his land. For several years after the country became open for settlement, every one imagined that grain would grow, no matter how put in, but now the man is devoid of reason who thinks he is sure of a crop without any exertion on his part. It is true that since 1882 we have had one year in which the land required little or no preparation for the production of an abundant crop, but only too many realize the loss in the remaining years from poor cultivation.

'Our seasons point to only one method of cultivation by which we may in all years expect to reap something. It is quite within the bounds of possibility that some other and perhaps more successful method may be found, but, at present, I submit that 'fallowing' the land is the best preparation to ensure a crop. Fallowing land in this country is not required for the purpose of renovating it, as is the case with the worn-out lands in the east; and it is a question as yet unsettled how much or how little the fallows should be worked, but, as we have only one wet season during the year, it has been proved beyond doubt that the land must be ploughed the first time before this wet season is over if we expect to reap a crop in the following year. The wet season comes in June and July, at a time when every farmer has little or nothing else to do, and it is then that this work should be done. Usually seeding is over by the first of May, and, to secure the best results, the land for fallow should be ploughed from 5 to 7 inches deep as soon after this date as possible. Land ploughed after July is of no use whatever unless the rains in August are much in excess of the average. A good harrowing should succeed the ploughing, and all weeds and volunteer grain be kept down by successive cultivations. A good deal of uncertainty is felt with regard to a second ploughing; some holding that it is useless; others maintaining that it is an injury; while others again have found it to give from five to ten bushels per acre more than one ploughing. So far, the experiments on the Experimental Farm have shown that by far the best returns have been received from two ploughings, and more noticeably was this the case when the first ploughing has been completed in May or June. Without doubt, two ploughings cause a greater growth of straw, and consequently, in a wet year, the grain is several days later in maturing, causing greater damage from frost; but taking the seasons so far passed (1884 excepted), two ploughings with as much surface cultivation as possible in between, may be safely recommended.

'Above all, it is of the greatest importance that the first ploughing be as deep as possible, and that it be done in time to receive the June and July rains.'

FROM REPORT OF 1906.

'In view of the fact that every year brings to the Northwest many new settlers who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

'In all sections where the sod is thick and tough, breaking and back-setting should be done; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

'The former is generally applicable to the southern parts of Saskatchewan and the latter to Alberta and the northern parts of Saskatchewan, where the land is more or less covered with bluffs.

SHALLOW-BREAKING AND BACK-SETTING.

'The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

'Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three to four inches will give better results.

'After back-setting, the soil cannot be made too fine, and the use of the disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

'Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible, usually from four to five inches.

'When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

'Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

SUMMER-FALLOWS.

'The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Saskatchewan.

'The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Northwest, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

'It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown and in many cases, bearing fully matured seed. It is then ploughed.

'By this method, which, no doubt, saves work at the time, the very object of a summer fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

'The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and, while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or of fall or spring cultivation.

'As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

'*First Method.*—Ploughed deep (6 to 8 inches) before the last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

'Result.—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

'*Second Method.*—Ploughed shallow (3 inches deep) before the last of June; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

'Result.—Poor crop in a dry year; medium crop in a wet year. Soil not sufficiently stirred to enable it to retain the moisture.

'*Third Method.*—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

'Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

'*Fourth Method.*—Ploughed deep (7 or 8 inches) before the last of June; surface cultivated during the growing season.

'Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

'Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

'In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture into the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

'Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.'

DRY FARMING.

During the past two years the term 'dry farming' has been applied in Alberta to what was formerly known in the west as 'summer fallowing.'

With the exception of the addition of the use of a soil-packer, there is no change in the methods formerly employed, when the spring rains and frequent cultivation were depended upon for the packing of the soil.

A packer is, without doubt, a most useful implement on the farm, and where from any cause the soil is loose, it should be used. It is, however, an expensive implement, and within the means of comparatively few of the new settlers. Fortunately, early ploughing and frequent shallow cultivation may be depended upon to produce equally satisfactory results.

CULTIVATION OF STUBBLE.

When farmers summer-fallow one-third of their cultivated land each year, as they should, one-half of each year's crop will be on stubble. For wheat, the best preparation of this land is to burn the stubble on the first hot, windy day in the spring, and either cultivate shallow before seeding or give one or two strokes of the harrow after seeding; the object being to form a mulch to conserve whatever moisture may be in the soil until the commencement of the June rains.

The portion intended for oats or barley should be ploughed four or five inches deep, and harrowed immediately; then seeded and harrowed as fine as possible. In

case time will not permit ploughing, good returns may be expected from sowing the seed oats or barley on the burnt ground and discing it in; then harrowing well.

FALL PLOUGHING.

With regard to fall ploughing, it may be said that, as a rule, on account of short seasons and dry soil, very little work can possibly be done in the fall, but if the stubble land is in a condition to plough and the stubble is not too long, that portion intended for oats and barley may be ploughed, if time permits.

It is, however, a mistake to turn over soil in a lumpy or dry condition, as nine times out of ten it will remain in the same state until May or June, with insufficient moisture to properly germinate the seed, and the crop will be overtaken by frost.

CATTLE.

The herd on the Farm consists of 34 pure Shorthorns and 19 grade cattle as follows: 2 bulls, 14 and 19 months old respectively, 4 bull calves, 23 cows and heifers and 5 heifer calves, 3 grade cows and 19 grade steers. All were tested for tuberculosis in the fall and found quite health

FEEDING TEST.

A test was carried on during the past winter of feeding 8 steers between 3 and 4 years of age, and 8 steers between 2 and 3 years of age, the exact ages not being known, with the object of comparing the gains made by the younger and older lots. The test commenced, after a preparatory feeding of two weeks, on November 30 and finished on March 22, a period of 16 weeks.

The ration was the same for both lots, consisting of all the cut oat straw and corn ensilage the animals would eat, equal parts of ground barley and oats, and linseed meal.

Lot No. 1 (3 to 4 year steers) consumed 70 lbs. of straw and 170 lbs. of ensilage daily.

Lot No. 2 (two to three year steers) consumed 65 lbs. of straw and 155 lbs. of ensilage daily.

Both lots were fed 6,048 lbs. of meal and 896 lbs. of linseed during the 16 weeks. This was 3, 6, 8, and 10 lbs. per day for four months respectively, and 1 lb. linseed meal daily.

No value is placed on the straw. The steers, excepting one, were purchased, and were obtained part in Saskatchewan and part in Manitoba, 10 being Shorthorn grades and 6 Polled Angus grades.

WEIGHTS AND GAINS.

—	Lot No. 1. — 3 and 4 years old.		Lot No. 2. — 2 and 3 years old.	
	Weight.	Gain.	Weight.	Gain.
	Lbs.	Lbs.	Lbs.	Lbs.
Start of Test	9,290	....	7,675	
End of 1st Month	9,730	440	8,205	530
" 2nd Month	10,120	390	8,550	345
" 3rd Month	10,585	465	8,870	320
" 4th Month	11,140	555	9,230	360
Total gain during test	....	1,850	....	1,555
Average gain per head	....	231¼	....	194⅜

TOTAL WEIGHT and estimated Value of Feed consumed.

—	Lot No. 1.		—	Lot No. 2.	
	Weight.	Value.		Weight.	Value.
	Lbs.	$ cts.		Lbs.	$ cts.
Straw	7,840		Straw	7,280	
Ensilage	18,840 at 20c. per ton	18 84	Ensilage	17,360 at $2.00 per ton	17 36
Meal	6,048 at 1c. per lb	60 48	Meal	6,048 at 1c. per lb	60 48
Linseed	896 at 3c. per lb	26 88	Linseed	6,048 at 3c. per lb	26 88
Total cost		106 20	Total cost		104 72
Cost per head		13 27½	Cost per head		13 09

SUMMARY of the Financial Results of the Transaction.

—	Lot No. 1.	Lot. No. 2.
Weight at Start	9,230 lbs.	7,280 lbs.
Value at 3¼ cents	$301 92	$249 43
Cost of feed	$106 20	$104 72
Weigth at finish	11,140 lbs.	9,230 lbs.
Value at 5¼ cents	$584 85	*$461 50
Net Gain	$177 05	$107 43
Net profit per head	$22 13	$13 42

* At 5 cents.

BEES.

I am sorry to report poor success with bees during the past year. Although the season was a fine one for honey, none of the swarms made any surplus.

On November 8 last. 5 hives were put into the cellar, and on March 2 were taken out, on account of the warm weather.

Three of the swarms were dead, with considerable honey in each hive. The remaining swarms are very weak, with abundance of honey.

HORSES.

Twelve horses are at present on the Farm. Ten of these are draft horses and 2 light animals are used for driving. Three of the draft animals are aged and only fit for light work.

SWINE.

Two breeds are kept at present, Yorkshire Whites and Berkshires and consist of males and females of each breed.

During the past year, 7 pigs were sold for breeding purposes, and 29 for pork.

POULTRY.

Barred Plymouth Rocks and Black Minorca fowls are kept on the Farm.

DISTRIBUTION OF SAMPLES.

A distribution of samples of the products of the Farm was made in the spring to residents of Saskatchewan. The distribution to residents in Alberta from this farm was discontinued, as these are now supplied from the Experimental Farms at Lethbridge and Lacombe in that province.

Following is a list of the samples sent out:—

Wheat, 3-lb. bags	206
Oats, 3-lb. bags	155
Barley, 3-lb. bags	52
Peas, 3-lb. bags	60
Sundries (flax, rye), 3-lb. bags	14
Potatoes, 3-lb. bags	500
Total	987

CORRESPONDENCE.

During the twelve months ending March 31, 1910, 6,963 letters were received and 6,908 mailed from this office.

In letters received, reports on samples are not included, and, in letters mailed, circulars of instructions sent out with samples are not counted.

METEOROLOGICAL RECORDS.

Month.	Temperatures.					Rainfall.		Snowfall.	Bright Sunshine.
	Maximum.		Minimum.		Mean.				
	Date.	°	Date.	°	°	Days.	In.	In.	Hours.
1909.									
April	25	56	13	1	28·23	2	·13	0·13	176.1
May	27	81	1	11	49·29	7	2·92	0·25	216.4
June	18	86	24	34	59·27	11	2·30	....	224.4
July	24	90	14	48	64·22	11	4·89	....	236.3
August	26	91	28	38	63·13	7	3·58	....	320.5
September	8	86	23	29	57·8	1	·14	....	233.6
October	5	79	12	2	38·66	1	·14	·5	137.4
November	2	57	20	—20	17·92	2	·16	9·25	76.8
December	30	33	5	—30	1·42	......	......	12·00	35.7
1910.									
January	25	36	3	—40	6·7	1	·10	·5	78·8
February	28	36	23	—30	0·77	......	......	6·00	113·4
March	22	76	1	—5	36·13	3	1·29	·25	154·8
						46	15·65	28·88*	2,001·2

* Reckoning ten inches of snowfall as equivalent to one inch of rainfall the total precipitation for the year ending March 31, 1910, was 18·538 inches.

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR CENTRAL SASKATCHEWAN

REPORT OF WM. A. MUNRO, B.A., B.S.A., SUPERINTENDENT.

ROSTHERN, SASK., March 31, 1910.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present the first annual report of the work done on the Dominion Experimental Farm for Central Saskatchewan, established at Rosthern.

SITUATION AND CONDITION OF FARM.

The Farm is situated half a mile south of the town of Rosthern, adjoining and east of the Canadian Northern Railway and is in full view from the passing trains. It consists of about 152 acres, most of which had been cropped for a number of years previous to its purchase by the Dominion Government. There were on it a poorly constructed house and a small stable and implement shed.

PURCHASE OF FARM HORSES AND IMPLEMENTS.

The Farm was purchased in 1908 and the appointment of the Superintendent was made in March, 1909. Previous to my arrival, Mr. Angus Mackay, Superintendent of the Experimental Farm at Indian Head, Sask., had been directed to make purchases of horses and implements for this Farm, which he did in a very creditable manner. The horses, especially, were a very fine lot, consisting of four heavy draft, one general-purpose and a heavy carriage horse.

In the early part of March, 1910, three of the horses became infected with influenza. One of them recovered after a mild illness, another was quite seriously affected but slowly recovered, and the third died.

FENCING.

The Farm had been fenced with three strands of barbed wire on spruce posts, most of which were badly decayed. This fence was removed and a ten-strand woven wire fence put in its place. The posts are cedar, five-inch top and one rod apart.

TREATMENT OF LAND THE FIRST YEAR.

The land had been cropped in 1908 with wheat and oats and had been left unploughed. As it had been reported to be weedy, it was thought wise to summer-fallow it the first year, rather than to attempt any experimental work. About twenty acres were sown to oats, two acres to potatoes and the balance ploughed and thoroughly worked all summer. A hail storm on August 8 ruined the oat crop and greatly injured the potatoes and shrubs.

TREES AND SHRUBS.

More than a thousand trees and shrubs were received from the Central Experimental Farm, Ottawa. Two rows of trees, twenty feet apart in the row and twenty feet between the rows, and one row of shrubs ten feet apart in the row and twenty feet from the inside row of trees were planted on the east, north and most of the west side of the Farm. The trees consisted of American White Elm, Green Ash, Manitoba Maple, Russian Poplar and Hackberry. The shrubs were made up of a great number of varieties, most of which have been tested and have proven hardy in this climate. Those trees and shrubs which were not planted in these rows were heeled in a nursery and stood the season fairly well.

NEW BUILDINGS.

During my illness, caused by a severe fall on June 3, the foreman, Mr. Paul C. Black, under your direction, built a machinery shed and had some improvements made on the foreman's house which is now a rather fine-looking building, but the old part of which was reported as being very cold during the winter months. The implement shed is 20 feet x 60, with a shanty roof. It is well constructed, but is hardly large enough to house all the implements.

The Superintendent's house, contracted for in July, was not sufficiently completed to be occupied until the middle of February. As the nearest house obtainable during this period was a mile and a half from the Farm, a great deal of inconvenience in the supervision of the work was caused on account of the distance to be travelled.

CORRESPONDENCE.

The correspondence has not been very heavy during the past year, the total number of letters received being 350 and those sent out 308.

MEETINGS ATTENDED.

The many duties incident to getting the Farm in readiness for the coming year somewhat handicapped me in becoming acquainted with other sections of the province by attending meetings. However, I was enabled to act as judge at five seed fairs, to speak at three Institute meetings, to attend the Agricultural Societies' Convention at Regina, and the Saskatchewan Grain Growers' Convention at Prince Albert, from all of which much was learned of the conditions prevailing in the province which will serve as a guide in the conducting of Experimental Farm work in the future.

I have the honour to be, sir,

Your obedient servant,

WM. A. MUNRO,

Superintendent.

EXPERIMENTAL FARM FOR SOUTHERN ALBERTA

REPORT OF W. H. FAIRFIELD, M.S., SUPERINTENDENT.

LETHBRIDGE, ALTA., March 31, 1910.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit the third annual report of the operations on the Experimental Farm for Southern Alberta, at Lethbridge, for the year ending March 31, 1910. Two seasons' crops have been grown, the first spring and summer after the Farm was established being devoted to the breaking and preparation of the sod.

The season of 1909 was somewhat remarkable, owing to the fact that the total precipitation for the calendar year was less than has been experienced for a number of years and also because of the exceptionally light rainfall for the month of June. Official meteorological observations have been taken at the city of Lethbridge since 1902. The average precipitation for the eight years has been 16·77 inches. The total precipitation recorded at this Farm from January 1 to December 31, 1909, was 10·32 inches. In this the snowfall is reduced to water by calculating ten inches of snow to be equivalent to one inch of water. At the end of this report is a table which gives the precipitation each month from April 1, 1909, to date. The total precipitation for the first three months of 1909 was 1·0 inches. A point that should not be lost sight of is that the amount of precipitation in one year affects the crop returns the following season in a very appreciable manner. Some of the moisture from the very heavy rains of June, 1908, was doubtless carried over in our retentive sub-soil to aid crops in 1909, even on land that had produced a crop of grain in 1908. On land summer-fallowed in 1908, the major portion of this moisture was carried over, well down in the sub-soil, for the use of the 1909 crop. Carrying this idea out, it is reasonable to suppose that there was not as much moisture left in the sub-soil after the crop of 1909 was taken off, owing to the lighter rainfall of 1909, as there was in the fall of 1908. This point is of interest owing to its bearing on the coming crop of the season of 1910.

During the winter of 1908-9, some low temperatures were recorded at the end of December and the first half of January. The rest of the winter was not particularly severe.

The first work done on the land in the spring of 1909 was some harrowing on March 17. Although it was not possible to work continuously on the land from this date to the first of April, considerable harrowing and discing was accomplished. By April 1, ploughing and seeding was general throughout the district. The last frost in the spring was on May 29 when 29·8° was recorded. The first frost in the fall was on August 28, when the mercury dropped to 29·8°. On August 6, a slight frost was experienced in some localities in the southern portion of the province, but at the Experimental Farm no effects of frosts could be observed on the tenderest foliage. The minimum temperature recorded for that day was 33·8°. Harvesting began on August 6, when two plots of winter wheat, some Mensury barley, and a plot of Riga wheat were cut. This was eleven days later than the first winter wheat was cut in 1908.

Undoubtedly the most disappointing feature of the season of 1909 to the farming interests of Southern Alberta was the almost complete failure of winter wheat, except in a few favoured localities. It is difficult to offer a satisfactory explanation for this quite general failure of what had begun to be considered a staple crop. To the dry fall, coupled with unfavourable conditions during the latter part of the winter and early spring, may be attributed much of the cause for the unsatisfactory condition of the winter wheat fields in the spring of 1909.

It must not be inferred, however, that the failure of the winter wheat to come through the winter in a desirable manner was the cause of any real loss to the district. As a matter of fact, the preparation that the land had received during the previous summer for the reception of the winter wheat left it in ideal condition to seed with spring grain, the result being that a large majority of the fields of spring grain that gave the greatest yields were resown winter wheat fields.

TWO FARMS.

Of the 400 acres on the Farm, one-fourth can be irrigated; the balance is devoted to 'dry' or non-irrigated farming. As stated in the last report, two Experimental Farms are really being operated at Lethbridge. Their object is, not to compare the relative merits of the two systems, but to study their individual problems. To aid in doing this and to prevent confusion, the report is divided into two parts. Part I. deals with the results from the non-irrigated or 'dry' farm, and Part II. with the results from the irrigated farm. In this connection, it might be well to point out that the yields of even the same variety of crop grown on the two farms in any one season are not necessarily comparable and that an increased yield on the irrigated portion may not be entirely due to irrigation, owing to the fact that the preparation of the land on the two fields may not have been identical.

Although nearly all of the tests carried out are the same on both the dry and the irrigated farms, still, it would be well for the reader, if he wishes to get a comprehensive grasp of the work, to read both parts. For example, any suggestions offered regarding the preparation of the land, particularly the raw prairie, in Part I., is equally applicable to the preparation of the land that is intended to be irrigated. Again the report of the trees and shrubs that have been tested so far on the Farm will be found in Part II., and any data in regard to their hardiness will apply to the same varieties if set out on non-irrigated land, providing the land has been properly prepared the year previous and intelligent cultivation is given.

PART I.—THE NON-IRRIGATED OR 'DRY' FARM.

EXPERIMENTS WITH WINTER WHEAT.

The results for the season with winter wheat have been quite disappointing for, both in the field lots and in the test plots, much winter-killing occurred, as is testified to by the low yields recorded below. The land on which all the wheat was sown was sod, broken during May and June, and was well-disced and harrowed, but not backset. The grain on the field lots and on a majority of the small plots barely showed above the ground, some of it hardly germinating in the fall, and, with the exception of the plots sown July 15, August 1 and 15, none of it started to stool.

One of the most interesting results from an experimental standpoint of the unusual season was the fact that out of nine varieties of winter wheat sown, only those of the Turkey Red type, or as it is commonly, though incorrectly, called here, Alberta Red, lived through. These nine varieties were sown on September 3, 1908,

in one-sixtieth acre plots at the rate of about forty-five pounds of seed per acre. The character of the soil is a sandy to a clay loam. The preparation of the land was the same for all winter wheat sown, both in plots and in field lots, being sod prepared as described above. These varieties all came up fairly well, but failed to stool to any extent in the fall. In the spring the only ones that were not dead were Kharkov and Turkey Red No. 380. These two are practically the same variety. Of these, only about fifty per cent of the stand was left and the vitality of the plants remaining seemed to be low, as indicated by the small amount of stooling that took place. No rust was observed. The seven varieties that killed out completely were, Abundance, Early Windsor, Prosperity, Red Velvet Chaff, Reliable, Dawson's Golden Chaff and Red Chief.

WINTER WHEAT—Test of Varieties (Non-irrigated).

Number of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				In.				Bush.	Lbs.	Lbs.
1	Kharkov	Aug. 9.	340	30	Medium stiffness	2½	Bearded	22	00	64
2	Turkey Red No. 380 (from Kansas)	" 16.	347	34	..	2½	.	14	30	65

FIELD LOTS OF WINTER WHEAT.

These fields were broken from the native prairie in June, 1908, but were not backset. They were sown the first part of September.

Variety.	Area.	Yield per Acre.	
	Acres.	Bush.	Lbs.
Kharkov	2·7	22	45
"	1·0	24	00
"	13·9	16	47
Turkey Red No. 380	4·1	23	55

WINTER WHEAT 'STUBBED' IN AFTER HARVEST.

On account of winter wheat not ripening early enough to be harvested before August, it is not practicable, after this grain is cut, to plough the land and reseed immediately, owing to the fact that the one crop must be cut and the next sown at the same season, or, to be more exact, in the same month. However, the question is often asked whether it would not be possible to run a seed drill immediately behind the binder and thus get the crop planted in time to catch any fall rains that might come. Although farmers at different times have attempted to carry out this plan, it has rarely been very profitable. To test this practice, a field of winter wheat was sown in September, 1908, at the rate of about 45 lbs. of seed per acre, after a crop of winter wheat had been harvested. No preparation of a seed-bed was attempted. The seed was sown with a single disc drill. The soil was dry at the time of seeding.

The crop yielded at the rate of 10 bushels and 20 pounds per acre.

WINTER WHEAT—DIFFERENT DATES OF SEEDING.

In studying the conditions that might influence winter killing, the experiment in which the winter wheat is sown at different dates is interesting. Results for the two years are here given.

The size of the plot used in 1908 was one-eighth of an acre and the variety was Turkey Red. In 1909, one-tenth acre plots were used and the variety was Kharkov. In both years the grain was sown on breaking, which was backset in 1908, but not in 1909.

WINTER WHEAT—Different Dates of Seeding.

Yield 1908.		Date of Sowing.	Date Ripe in 1909.	Yield 1909.		Average for Two Years.	
Bush.	Lbs.	1908.		Bush.	Lbs.	Bush.	Lbs.
00	00	July 15	Aug. 10	6	00	00	00
00	00	Aug. 1	" 4	23	50	..	..
46	51	" 15	" 4	27	50	37	21
54	00	Sept. 1	" 16	26	20	40	10
38	48	" 15	" 15	6	30	27	39
33	00	Oct. 1	" 28	16	20	22	10
28	32	" 15	" 23	18	50	23	41
25	44	Nov. 1	" 23	14	10	19	57
12	16	" 15	" 23	11	10	11	43
11	20	Dec. 1	....	..	..	..	..

Studying the yields given in the table for 1909, it will be noted that the wheat sown on July 15 yielded but six bushels to the acre, and it should be mentioned that this plot came up well and made a vigorous growth before the winter set in. The next two dates of seeding, August 1 and 15, also made a good growth, but not quite so much as the first sowing. That sown on September 1 did not come up very well and practically no stooling took place. The increased yield from the plot sown October 15 is of interest, though rather difficult to explain. The wheat sown on this date germinated, but did not show above the ground, so it would indicate the importance of a farmer examining his winter wheat fields very carefully in the spring before reseeding. A very good way is to dig up a square foot of soil containing a drill row without disturbing the plants, late in March or early in April, and put it in a box in the house, where it should be kept moist. The manner in which the plants grow or fail to grow will allow one to gain some idea of their vitality. It is very reasonable to suppose that, though this plot sown on October 15 yielded less than nineteen bushels per acre, with more favourable conditions during April the yield might have been very materially increased.

WINTER WHEAT—RATES OF SEED PER ACRE.

The proper amount of winter wheat to sow per acre is a question that has provoked considerable discussion among the farmers in Southern Alberta for the past few years. The generally accepted opinion up to the present time has been that light seeding, by which is meant about three pecks to the acre, was best. But in discussing this matter during the past year with some of the best farmers in the district, the writer has been assured, by some of them at least, that they believe that somewhat heavier seeding would be wise. This idea is supported by the two years' tests that we have been able to carry out along this line, although the work of only two seasons is too brief to draw definite conclusions from. The following table gives the results for the past two years. The size of the plots in 1908 were one-eighth acre each; in 1909, one-tenth acre. The plots were sown September 4, 1908, and the variety used was Kharkov.

WINTER WHEAT—Rates of Seed per Acre.

Rate of Seed per Acre.	Date Ripe.	Yield in 1909.		Average for Two Years.	
Lbs.		Bush.	Lbs.	Bush.	Lbs.
15	August 17	16	40	33	20
30	" 16	31	00	42	30
45	" 16	37	00	46	54
60	" 11	51	40	55	26
75	" 12	54	20	57	46
90	" 12	52	40	56	28
105	" 12	42	00	51	24
120	" 12	44	00	52	00

In considering these tables it must be remembered that winter-killing occurred in all the 1909 plots, but, notwithstanding this, the fact that the results agree with those of the previous season is of interest.

EXPERIMENTS WITH SPRING WHEAT

Although winter wheat yields more, under normal conditions, than does spring wheat, still, owing to a certain element of uncertainty that will always be connected with the wintering of wheat sown in the fall, together with the fact that it is possible to obtain a crop of spring grain the same season that it is sown, it is probable that the importance of spring wheat will never be second to winter wheat in Southern Alberta. Although our results on the Farm for the past season have been very satisfactory, the average was not as high as in the season of 1908. The quality was excellent.

SPRING WHEAT—TEST OF VARIETIES.

Fourteen varieties of spring wheat were sown on April 8 at the rate of about one bushel and one peck per acre in plots of one-sixtieth acre each. The land was sod, broken the previous May, but not backset. The character of the soil was a sandy to a clay loam. No rust was observed on any of the varieties.

SPRING WHEAT—Test of Varieties (non-irrigated).

Number of Plot.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw, Including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				In.	In.		Lbs.	Bush.	Lbs.	Lbs.
1	Percy	Aug. 13	127	32	3	Beardless.	2,160	31	0	63
2	Preston	" 13	127	34	3	Bearded.	2,400	31	0	62
3	Marquis	" 12	126	33	2½	Beardless.	2,340	31	0	64
4	Red Fife	" 14	128	35	3	"	2,760	29	0	61
5	Chelsea	" 9	123	30	3	"	1,830	28	30	63
6	White Fife	" 14	128	35	3	"	2,310	28	30	62
7	Stanley	" 13	127	36	3½	"	2,250	28	30	62
8	Pringle's Champlain	" 12	126	32	3	Bearded.	2,040	28	0	62
9	Huron	" 13	127	30	3	"	2,280	27	0	62
10	Bishop	" 11	125	33	3	Beardless.	1,920	25	0	61
11	Hungarian White	" 9	123	28	3	Bearded.	1,860	25	0	62
12	Kubanka (durum)	" 13	127	38	2½	"	2,130	24	30	64
13	Gatineau	" 16	130	36	3½	"	2,100	23	0	60½
14	Riga	" 4	118	35	3	Beardless.	2,010	20	30	63

FIELD LOTS OF SPRING WHEAT.

On Backsetting.—A field of 4½ acres of Red Fife was sown May 4. It was cut August 23 and yielded at the rate of 27 bushels and 45 lbs. per acre.

On Fresh Breaking.—The temptation is very great to new settlers to break up land in the spring and sow it immediately with grain rather than to let the piece stand over the first summer after it is broken, to allow the sods to rot and to get a supply of moisture stored up in the sub-soil. The yield of oats, wheat or barley on land so treated is never very high, even in the most favourable year. The results this season from a field so handled are as follows. One and one-fourth acres of land were broken early in April about four inches deep, then rolled, double-disced twice, harrowed once between the discings and twice after. It was sown April 9 with Red Fife at the rate of about a bushel and a peck per acre. It was cut August 16 and yielded at the rate of only 10 bush. and 20 lbs. per acre.

EXPERIMENTS IN BREAKING VS. BREAKING AND BACKSETTING.

In May, 1908, a piece of raw sod land was broken about 3½ inches deep. Part of this was backset early in August, 2 to 2½ inches deeper than it was broken, and the remainder of the piece was merely disced thoroughly and harrowed during July. In April, 1909, both pieces were sown with Red Fife wheat at the rate of about a bushel and a peck to the acre. The two plots yielded as follows:—

First Crop on New Land—Breaking *vs.* Breaking and Backsetting.

Area Acres.	——	Bush.	Lbs.
0.65	Yield per acre on land backset..........	30	31
0.87	" " not backset..........	25	40
	Increased yield per acre on land backset..........	4	51

In last year's annual report the results of an experiment similar to the above were given in which it was found that the average increase in yield due to backsetting with the three varieties of winter wheat then tested was 2 bushels and 8 lbs. per acre. Some of this same land was sown with spring wheat in 1909, to ascertain what effect the backsetting would have on the second crop of grain. After the winter wheat was cut, nothing was done to the land until the spring, when part of it was double-disced and harrowed, and another part was ploughed early in April about 4½ inches deep and harrowed. Both pieces were sown with Red Fife wheat on April 9 at the rate of about one bushel of seed per acre. The following table gives the results obtained:—

Second Crop on New Land—Breaking *vs.* Breaking and Backsetting.

——	Ploughed in Spring.		Disced in Spring.		Average Yield from the two Fields.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Yield per acre on land backset..........	20	50	17	40	19	15
" " not backset..........	16	40	17	58	17	19
Average increase of second crop from land backset..........					1	56

The average increase in yield of the second year's crop on the backsetting of 1 bush. and 56 lbs. added to the average increase in the yield of the winter wheat on the same land the year before of 2 bush. and 8 lbs. makes a total increase for the two years of 4 bush. and 4 lbs. per acre.

SPRING WHEAT—RATES OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre each. They were sown April 16. The yields in all the plots are low for 1909, as the grain did not appear to stool well for some reason. The plots were put in on sod both years. In 1908, the land had been broken and backset the previous summer, in 1909, the land had been broken the previous May but had not been backset. The variety used both years has been Red Fife.

SPRING WHEAT—Rates of Seed per acre (non-irrigated.)

Rate of seed per acre.	Date Ripe.	Yield in 1909.		Average for two years.	
Lbs.		Bush.	Lbs.	Bush.	Lbs.
15	Aug. 27......	6	20	11	30
30	" 26......	12	40	18	20
45	" 23	19	40	24	30
60	" 23	21	20	26	0
75	" 22......	21	40	26	50
90	" 18......	22	20	27	20
105	" 18......	26	40	29	40
120	" 18....	26	40	29	0

The above table is of considerable interest, even though it has been carried on but for two years. When we have had an opportunity of continuing this experiment for at least a year or two longer, the average results will be much more reliable.

COMMON EMMER.

On April 8 a one-sixth acre plot of Common Emmer was sown on land broken the previous May. The grain was ripe August 13. Number of days maturing, 127; length of straw including head, 27 inches; length of head, 2 inches; yield per acre of straw, 1,800 lbs.; of grain, 1,380 lbs.; weight per measured bushel, 50 lbs.

CULTURE OF WINTER AND OF SPRING WHEAT.

So many letters of inquiry concerning the growing of winter wheat and also of spring wheat are received at the Farm that it may be excusable to give a very brief outline of the general practice followed in the growing of these crops in Southern Alberta, even at the risk of repeating more or less of what was said in our last year's report. Anything in the way of preparation of the soil that will apply to spring wheat, is of course applicable to oats or barley.

PREPARATION OF SOD LAND.

The sod should be broken in May or in June, while the soil is moist and before the rainy season is over. May breaking usually gives better results than June breaking, the reason for this being that less of the rains is used up by the growing grass and, consequently, more is stored in the subsoil; also, the moist weather of June is conducive to the rotting of the grass roots. The sods should be rolled or flattened

down in some manner as fast as broken. This connects the furrow slice with the subsoil and facilitates the rotting process. The rolling should be done at noon and at night before the teams leave the field. If a tractor is used, a weighted roller should be attached behind the ploughs. The common practice is to break 3½ to 4½ or even 5 inches deep; after this, the surface cultivation should be shallow. No attempt should be made to cut through the sods with the discs, but merely to go deep enough to form a mulch on the top to prevent rapid evaporation. If one is prepared to do this surface cultivation after a rain, while the sods are moist, it will be found that the land is worked more economically and to much better advantage. Enough work should be done to get sufficient loose material to fill in the cracks between the sods which will then rot sufficiently during the summer to be loose and in good condition for growing a crop the following spring. It is generally found necessary, if a thorough job is desired, to double-disc the land twice, using a drag harrow and possibly a float after each double-discing. The latter is a contrivance made of four or five two-inch planks a foot wide, twelve to sixteen feet long, laid flatways and lapped so as to resemble somewhat a washboard. This implement, when weighted with stone or sod, added to the weight of the driver, crushes quite effectively small pieces of sod which, when dry, could not be broken up well with the drag harrow. The float should be followed immediately with a harrow, for evaporation takes place very rapidly from the land when the surface is left too smooth. If the floating is done just before seeding, the seed drill will, of course, roughen the surface. A light harrowing immediately after seeding is advisable.

For the best results with spring grain, this work should be done on the sod during the previous summer before the harvest. In this way, all the land requires in the early spring of the next year is a harrowing just as the frost draws out, to prepare it for the seed-drill.

SOWING ON FRESH BREAKING.

Considerable land during the past few years has been broken in April and immediately sown to grain. Although fair results are often obtained in this way, it is not a practice that can be recommended, for, if the season is dry, the resulting crop may be disappointing, and, on account of the sods not having had a chance to rot properly, the second crop is not nearly as good as the second crop after breaking the land in May or June and allowing it to lie fallow that summer as described above.

BACKSETTING.

Although it is not customary to backset in this district, it is a practice that cannot be too highly recommended. When backsetting is to be done, the sod should be broken as shallow as practicable and immediately rolled, or, if a roller is not available, it may be flattened down by a weighted float. The earlier the breaking after the grass has started growth, the better will be the results. In the latter part of July or early in August, if winter wheat is to be sown, the land is again ploughed (with stubble bottom ploughs) about two or three inches deeper than it was broken. The depth of this second ploughing should be governed in a measure by the depth of rotting that has taken place in the subsoil. In ordinary years, where the land has been broken in May or early in June, the grass roots for about two inches down in the subsoil have become rotted. If spring grain is to be sown, this second ploughing or 'backsetting' may be done any time in August or even in September when the sods and grass roots are better rotted, but, on the other hand, the land is apt to be a little drier at that time and consequently the soil is inclined to be too loose, which tends to make it dry out. This condition can be largely overcome by the use of a subsurface packer used at noon and at night before leaving the field. The packer should be immediately followed by a harrow. After backsetting, a seed bed can often be prepared by the use of a harrow only, but a disc should be used if the condition of

the ground requires it. Special attention should be called to the importance of harrowing each day's ploughing at night before leaving the field. If an engine is used, the harrow should be attached to the plough, or, if horses are used on a sulky or a gang plough, one section of a harrow should be attached so that the land is harrowed as fast as it is turned. This practice of harrowing land immediately after it is ploughed should always be followed; too much stress cannot be laid on this point.

It might be well to state here that backsetting is the only feasible way of preparing land that is to be used for a garden or for trees and shrubs the second season after a settler goes on raw land.

SUMMER-FALLOWING.

In speaking of this subject Mr. Angus McKay, Superintendent, Experimental Farm, Indian Head, puts in a concise way some of the advantages of summer-fallow, with special reference to its application to conditions in southern Saskatchewan, which are in so many ways similar to those found in southern Alberta, the one notable exception being that, so far, winter wheat has not been very successful there. He says:—

> Among the many advantages to the credit of the practice of summer-fallowing may be mentioned: The conservation of moisture, the eradication of weeds, the preparation of the land for grain crops at a time when no other work is pressing, the availability of summer-fallowed land for seeding at the earliest possible date in the spring and the minor advantages of having suitable land for the growing of pure seed, potatoes, roots and vegetables at the least cost and with the greatest chance for success, and that of being able to secure two crops of grain with little or no further cultivation.

Mr. Mackay adds, however:—

> 'Summer fallowing undoubtedly has some disadvantages, but, so long as the growing of grain, and more particularly wheat, remains the principal industry of the province, it will be necessary to store up moisture against a possible dry season, to restrain the weeds from over-running the land and, on account of the short seasons, to prepare at least a portion of the land to be cropped in the year previous to seeding and a well made summer-fallow is the best means to this end. Among the disadvantages are: The liability of the soil to drift, the over-production of straw in a wet season, causing late maturity and consequent danger of damage by frost, and it is claimed the partial exhaustion of the soil. The two former may, to a great extent, be overcome by different methods of cultivation, and, if the soil can be prevented from drifting, I am satisfied that one of the reasons for the latter contention will disappear.'

The growing of winter wheat in Southern Alberta gives an added reason why in that province, farmers should give summer fallowing even more careful consideration, if possible, than where spring wheat alone is raised. In this connection, summer fallowing certainly has a distinct advantage that is not mentioned in the quotation above for it must be admitted that there is a somewhat greater risk in getting a stand of winter wheat on sod than on well-prepared summer-fallow. In seasons like that of 1909, in which there was little or no precipitation during the months of August, September and October, it is very difficult to get the grain sown on fresh breaking. Although there is ample moisture in the sub-soil, the sods themselves have become very dry and have not rotted sufficiently by August to allow the discs or shoes of the seed drill to cut through them so that the seed may be deposited on the moist subsoil. Under these conditions, opportune rains must be depended upon to bring the seed up. On well-prepared summer-fallow conditions are quite different, for, if the land is ploughed in May or June, while it is moist, before the rainy season is over and while the weeds are not more than a few inches high, little trouble is experienced

in getting the lower part of the furrow slice firm and keeping it moist. The depth of the ploughing should not be less than five or six inches and seven or eight is recommended, and a harrow should immediately follow. Too much stress cannot be laid on the importance of doing this ploughing early, *i.e.*, before the weeds have had a chance to grow large enough to pump out the moisture that should be stored in the subsoil for the crop that is to follow. If, for example, the weeds and volunteer grain are allowed to grow a foot or more high and it is necessary to use a chain on the plough to get them turned under, the work on the summer-fallow is practically thrown away, for the land is certain to turn up lumpy and loose and the supply of moisture that should be in the subsoil has already been heavily drawn upon.

If, after the land is ploughed, heavy rains form a crust, it should be broken up with a drag harrow before the land has had a chance to dry out to any extent. Sufficient surface cultivation should be given during the summer to prevent all weeds from growing, *i.e.*, the land should be kept perfectly bare. Two of the best tools to do this with are an ordinary harrow and a duck-foot cultivator. The latter implement is too rarely seen on the grain farms of Southern Alberta. A serious mistake is made when a disc is substituted, for the reason that it cuts down too much and so forms too deep a mulch. It also pulverizes the land excessively, causing it to drift too readily with the wind. The duck-foot cultivator can be set very shallow, just deep enough to cut off the small weeds and it merely loosens the surface without making it fine, leaving it in a granular rather than in a powdery condition. Another great advantage of the cultivator over the disc, that will appeal strongly to farmers, is that a summer-fallow may be cleaned much more economically with it. Whereas it is necessary to double-disc a piece of ground if a satisfactory job is to be accomplished, with this cultivator the same four horses will cover at least twice as much ground in a day and do the work better.

TIME TO SOW.

Winter Wheat.—Our results for the past two seasons certainly indicate that from the middle to the latter part of August is the best time to sow. On the other hand, it must be admitted that at the time of writing (March 31, 1910) the most promising fields throughout the southern portion of the province are, quite generally those that were sown last July. This is due to the great amount of moisture received from July 25 to 28. Up to the present time, a greater portion of the winter wheat sown is put in on new land so that the lack of our usual rains in August and September prevented the later sown grain from germinating. On well prepared summer-fallowed land, where it is possible to maintain the moisture zone relatively near the surface, we have reason to believe that August sowing will give more satisfactory results as a rule than will July sowing.

Spring Wheat.—Early sowing is of prime importance. Every effort should be made to conclude the seeding of this grain by May 1.

QUANTITY OF SEED TO SOW.

This, as well as the proper time to sow, is a point about which we have not yet sufficient data at hand to draw very satisfactory conclusions, consequently, any statements that are made in this connection must be considered as tentative. Sixty pounds of winter wheat and seventy to seventy-five pounds of spring wheat is probably a safe quantity to sow per acre.

HARROWING THE GROWING GRAIN.

It is a commendable practice to harrow the grain while it is young to break any crust, the result of heavy rains, and to form a mulch to aid in the retention of moisture.

SMUT.

Both winter and spring wheat seed should always be treated for smut. Either the formalin or the bluestone method is satisfactory, providing the work is done carefully. Very smutty grain should never be used for seed, for, even when treated thoroughly, some smut is apt to appear in the resulting crop. If seed wheat is treated every year whether any smut can be found in it or not, the trouble will be kept in subjection. With either method, it is important that each kernel be thoroughly wet. As to the strength of the solution, it should be strong enough to kill the smut spores, but not so strong as to injure the vitality of the grain. The strength of solution most often recommended is one pound of formalin to 32 gallons of water, and in the case of bluestone, one pound thoroughly dissolved in 6 gallons of soft water. The sacks into which the grain is to be put after it is treated should have been dipped in the solution also. In the case of formalin, it is the fumes that kill the spores, so, after the grain has been treated, it is a good plan to throw it into a heap and cover it with a canvas or with empty sacks, but see that the covering is free from smut spores.

EXPERIMENTS WITH OATS.

Twenty-one varieties of oats were sown on April 21, at the rate of about two bushels per acre in plots of one-sixtieth acre each. The land was sod, broken the previous May but was not backset. The character of the soil was a sandy to a clay loam. There was no rust in any of the varieties.

OATS—Test of Varieties (non-irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw including Head.	Length of Head.	Kind of Head.	Weight of Straw	Yield per Acre.		Weight per measured Bushel after Cleaning	Average Yield for Two Years.	
				Inches	Inch.		Lbs.	Bush	lbs	Lbs.	Bush	lbs
1	Improved American	Aug. 11	112	35	7	Branching	1,680	82	32	37½	84	7
2	Lincoln	" 9	110	35	6	"	900	97	2	40½	78	33
3	Banner	" 9	110	30	6	"	1,860	56	16	40	68	13
4	Kendal White	" 11	112	33	6	"	2 280	65	10	39	67	22
5	Abundance	" 11	112	27	6	"	1,3[illegible]0	54	24	40	67	17
6	Golden Beauty	" 11	112	30	5	"	2,130	60	30	40½	67	0
7	Irish Victor	" 9	110	33	6	"	2,040	58	8	41	66	6
8	Improved Ligowo	" 9	110	34	6	"	2,160	60	0	41½	61	1
9	Danish Island	" 9	110	32	6½	"	2,010	59	4	40½	65	20
10	American Triumph	" 12	113	34	6½	"	1,710	52	32	40	63	27
11	White Giant	" 9	110	32	6½	"	2,190	59	4	38½	61	16
12	Wide Awake	" 12	113	28	6	"	1,740	58	8	41	61	1
13	Twentieth Century	" 10	111	32	5½	"	2,160	54	24	41	59	24
14	Siberian	" 12	113	35	6	"	1,920	54	24	39	57	7
15	Pioneer	" 11	112	27	6	"	2,100	52	32	41	55	10
16	Milford White	" 12	113	32	7	sided	1,860	54	24	40	55	5
17	Virginia White	" 9	110	31	6	Branching	1,650	50	10	41½	53	33
18	'Regenerated' Abundance	" 9	110	32	5½	"	1,350	52	2	..	..	..
19	Swedish Select	" 10	111	32	5½	"	1,560	47	22	43½	51	21
20	Thousand Dollar	" 10	111	30	6	"	1,980	45	30	42	50	25
21	Storm King	" 11	112	31	6½	sided	1,620	44	4	39½	47	27

RATES OF SEED PER ACRE.

The size of the plots used was one-twentieth acre each and they were sown April 19. In 1908, the land used had been backset the previous summer, in 1909 it had been broken the previous May but had not been backset. The variety used in 1908 was Tartar King and, in 1909, Banner.

OATS—Rates of Seed per acre (non-irrigated.)

Rate of Seed per Acre.	Date Ripened.	Yield per Acre.		Average Yield per Acre for Two Years.	
Lbs.		Bush.	lbs.	Bush.	lbs.
15	August 17	40	20	40	0
30	" 16	58	8	54	24
45	" 14	64	4	58	28
60	" 12	65	10	62	32
75	" 12	62	32	59	14
90	" 12	61	26	62	12
105	" 9	63	18	62	2
120	" 9	61	6	58	18

EXPERIMENTS WITH BARLEY.

Ten varieties of six-rowed, and ten varieties of two-rowed, barley were sown May 6 at the rate of about one and one-half bushels per acre in plots of one-sixtieth acre each. The land was sod, broken the previous May but not backset. The character of the soil was a sandy to a clay loam. No rust was observed on any of the varieties.

SIX-ROWED BARLEY—Test of Varieties (non-irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.	Inches.		Lbs.	Bush.	lbs.	Lbs.
1	Mansfield	Aug.	9	94	29	4	Bearded	1,260	48	36	52
2	Claude	"	9	95	27	2½	"	2,040	41	12	54
3	Odessa	"	9	95	26	3	"	1,980	41	12	51
4	Stella	"	11	97	30	2½	"	2,280	35	0	50½
5	Albert	"	5	91	32	4	"	1,800	33	36	50
6	Oderbruch	"	6	92	27	3½	"	1,560	33	36	51
7	Trooper	"	6	92	30	3½	"	2,080	33	36	49
8	Yale	"	9	95	27	2½	"	2,070	33	6	53
9	Mensury	"	4	90	30	4	"	1,590	31	42	49½
10	Nugent	"	10	96	27	3	"	1,920	31	12	49

TWO-ROWED BARLEY—Test of Varieties (non-irrigated)

No. of Plot.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw including Head	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Clean'ng
					Inches.	Inches.	Lbs.	Bush.	lbs.	Lbs.
1	Canadian Thorpe	Aug.	13	99	24	2½	1,800	46	12	53
2	Swedish Chevalier	"	13	99	24	2½	2,580	43	36	53½
3	Invincible	"	14	100	24	3	2,400	40	00	53
4	Standwell	"	13	99	24	2½	1,920	35	00	52½
5	Clifford	"	13	99	30	3	2,220	31	12	53½
6	Gordon	"	9	95	32	2½	1,920	31	12	52½
7	French Chevalier	"	14	100	28	3	2,040	28	36	54
8	Jarvis	"	11	97	34	3½	2,400	28	36	54
9	Danish Chevalier	"	13	99	26	3	2,040	27	24	53
10	Beaver	"	11	97	28	3	2,100	25	00	52½

RATES OF SEED PER ACRE (NON-IRRIGATED).

The size of the plots used was one-twentieth acre each and they were all sown May 7. The land used had been broken the previous May but had not been backset. Only one year's results are given. The variety used was Mensury.

Rate of Seed per Acre.	Date Ripened.		Yield.		Rate of Seed per Acre.	Date Ripened.		Yield.	
Lbs.			Bush.	lbs.	Lbs.			Bush.	lbs.
15	Aug.	17	1	12	75	Aug.	13	32	44
30	"	17	2	44	90	"	9	34	8
45	"	17	20	0	105	"	7	35	40
60	"	17	25	20	120	"	7	35	20

WINTER BARLEY.

A plot of winter barley, from seed produced on the Farm in 1908, was sown September 3, 1908. Although a good stand was obtained in the fall, none was alive in the spring.

EXPERIMENTS WITH PEAS.

The yields obtained from field peas this year were again low, although slightly higher than they were last year. From some small tests that were carried out on the irrigated Farm, we feel that it is quite probable that the yields can be increased materially by inoculation. A description of this test of inoculating the soil for peas is given under 'Peas' in Part II of this report.

Peas—Test of Varieties (non-irrigated).

Sixteen varieties of peas were sown April 22 at the rate of about two to two and a half bushels per acre, depending on the size of the pea, in plots of one-sixtieth acre each. The land was sod, broken the previous May but not backset. The character of the soil was a sandy to a clay loam.

Peas—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Size of Pea.	Yield per Acre.	Yield per Acre.		Weight per measured Bushel after Cleaning
				Inches.	Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Victoria	Aug. 17	117	30	2½	Large	1,530	25	30	63½
2	Picton	" 11	111	34	2½	"	1,320	22	00	64
3	Mackay	" 13	113	28	3	"	1,320	22	00	64
4	Prussian Blue	" 11	111	28	2½	Medium	1,290	21	30	65
5	Daniel O'Rourke	" 10	110	30	2	Small	1,290	21	30	63½
6	Prince	" 11	111	26	2	Medium	1,230	20	30	63½
7	Paragon	" 13	113	24	2½	"	1,200	20	00	64
8	White Marrowfat	" 13	113	32	3	Large	1,170	19	30	63¾
9	Early Britain	" 10	110	29	2	"	1,050	17	30	63
10	Golden Vine	" 9	109	27	2	Small	1,050	17	30	64½
11	Wisconsin Blue	" 13	113	27	2½	"	1,020	17	00	64¼
12	Black-eye Marrowfat	" 17	117	26	2	Large	1,020	17	00	
13	Chancellor	" 9	109	33	2	Small	990	16	30	
14	Gregory	" 18	118	25	2½	Medium	960	16	00	63
15	Arthur	" 11	111	24	2	"	960	16	00	63¼
16	English Grey	" 11	111	23	2½	"	930	15	30	64½

WINTER RYE.

A small field of winter rye was sown September 12, 1908, at the rate of about one bushel per acre. The land had been broken in May of that year but had not been backset. A good stand was obtained in the fall, but it did not stool a great deal. Some winter-killing occurred so that there was only a fair stand of grain in the spring.

It was ripe August 9. The height including head was 53 inches. Size of field 0·55 acres and the yield was at the rate of 24 bushels and 19 lbs. per acre.

EXPERIMENTS WITH INDIAN CORN.

The vacant or open land in Southern Alberta is being fenced up very rapidly, in fact, already there are districts where one would have to go for miles in any direction to find even a quarter section unfenced. Although settlers could depend on getting upland hay from this vacant land a few years ago, the time is now at hand when they will have to produce what hay they require on their own farms. Corn, cut green and cured in the stook, makes an excellent substitute for hay especially for cows and young stock of all kinds. Our short season does not allow any but the small-growing and extremely early varieties to ripen, but, if the land is properly prepared, varieties that will not ripen grain will produce a large amount of fodder per acre.

To get the best results, corn should be planted on land in which the sods have been thoroughly rotted. Very new land does not, usually, give good returns. There is no crop that appreciates stable manure more than corn, provided the manure is rotted and has become well incorporated into the soil.

TEST OF VARIETIES.

Seventeen varieties of corn were planted May 27 on sod land that had been broken the previous May and back-set in September. In the early spring of 1909, manure from the Canadian Pacific Railway stockyards was applied at the rate of about twelve loads per acre and was then ploughed under. The condition of the land was not the most desirable, as the sods were not well rotted and as a result, the ploughing of the land in the spring to cover the manure left the soil too open and loose. This, doubtless, accounts in a large measure for the low yields given in the following table. Two rows of each variety were planted in hills with three feet between rows, and another two rows of each variety planted with the seed a few inches apart in the row. They were all cut September 8. The yield of green fodder per acre in each case was computed from two rows each 66 feet long.

INDIAN CORN—Test of Varieties (non-irrigated).

No. of Plot.	Name of Variety.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
		Tons.	lbs.	Tons.	lbs.
1	Champion White Pearl	7	1,730	4	1,900
2	Early Mastodon	6	430	5	780
3	Selected Leaming	6	430	4	580
4	Compton's Early	6	100	4	1,680
5	Longfellow	5	1,880	5	1,000
6	Eureka	5	1,550	4	800
7	Salzer's All Gold	5	1,440	4	1,460
8	North Dakota White	5	1,330	4	800
9	Mammoth Cuban	5	1,220	4	360
10	Wood's Northern Dent	5	780	4	910
11	Angel of Midnight	5	450	4	30
12	Superior Fodder	4	1,680	3	1,370
13	Triumph	4	580	3	1,370
14	Mercer	4	470	3	930
15	Northwestern Dent	3	1,700	3	1,590
16	White Cap Yellow Dent	3	1,700	3	600
17	Davidson	2	1,170	2	1,170

EXPERIMENTS WITH TURNIPS.

Two varieties of turnips were tested. The preparation of the soil, a sandy to a clay loam, was the same as that for the Indian corn which is described above. They were planted in rows 30 inches apart and the yield in each case was computed from two rows each 66 feet long. Two sowings were made, the first on May 20 and the second on June 3. Both sowings were pulled on October 13.

TURNIPS.—Test of Varieties (non-irrigated).

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
		Tons.	lbs.	Bush.	lbs	Tons.	lbs.	Bush.	lbs.
1	Hall's Westbury..................	9	480	308	00	7	520	242	00
2	Halewood's Bronze Top..........	3	1,920	132	00	4	580	143	00

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were tested. The preparation of the soil, a sandy to a clay loam, was the same as that for the Indian corn which is described above. They were planted in rows 30 inches apart and the yield in each case was computed from two rows each 66 feet long. Two sowings were made in each case, the first on May 10 and the second on May 25. The mangels were all pulled on October 13.

MANGELS—Test of Varieties (non-irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Selected Yellow Globe..........................	13	1,456	457	36	6	1,860	231	00
2	Half Sugar White..................................	13	400	440	00	8	1,160	286	00
3	Mammoth Red Intermediate..........................	12	420	407	00	3	600	110	00
4	Giant Yellow Globe..................................	11	1,760	396	00	8	1,160	286	00
5	Prize Mammoth Long Red..............................	11	1,100	385	00	8	1,160	286	00
6	Perfection Mammoth Long Red..........................	11	1,100	385	00	7	1,840	264	00
7	Gate Post..	11	440	374	00	6	1,200	220	00
8	Yellow Intermediate....................................	10	1,120	352	00	6	1,200	220	00
9	Crimson Champion..	10	460	341	00	7	1,840	264	00
10	Giant Yellow Intermediate............................	9	1,800	330	00	6	1,200	220	00

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were tested. The preparation of the soil, a sandy to a clay loam, was the same as that for the Indian corn, which is described above. They were planted in rows 20 inches apart and the yield in each case was computed from two rows each 66 feet long. Two sowings were made in each case, the first on May 10 and the second on May 25. The carrots were all pulled on October 13.

CARROTS—Test of Varieties (non-irrigated.)

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	8	830	280	30	5	1,880	198	..
2	Ontario Champion	8	830	280	30	3	930	115	30
3	White Belgian	6	1,860	231	..	2	1,940	99	..
4	Improved Short White	5	890	181	30	5	1,286	188	6
5	Half-Long Chantenay	3	930	115	30	5	296	171	36

EXPERIMENTS WITH SUGAR BEETS.

Four varieties of sugar beets were tested. The preparation of the soil, a sandy to a clay loam, was the same as that for the Indian corn which is described above. They were planted in rows 20 inches apart and the yield in each case was computed from two rows, each 66 feet long. Average specimens of roots from each variety were sent to the Chemist of the Experimental Farms, Mr. Frank T. Shutt, carefully wrapped in oil paper to prevent, as much as possible, the loss of moisture. He made a determination of the per cent of sugar in the juice, the results of which are given in the last three columns of the table. Two sowings of each variety were made, the first on May 10 and the second on May 25. The roots were all pulled on October 13.

SUGAR BEETS—Test of Varieties (non-irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		Tons.	Lbs.	Tons.	Lbs.	p. c.	p. c.	p. c.
1	Vilmorin's Improved	11	1,760	4	910	17·05	19·69	86·6
2	French, Very Rich	9	810	3	1,920	17·78	20·23	87·8
3	Klein Wanzleben	6	1,860	5	890	17·44	20·29	85·9
4	Klein Wanzleben (Raymond Seed)	....	.....	4	1,900	21·17	23·49	90·1

EXPERIMENTS WITH POTATOES.

Nineteen varieties of potatoes were tested. The preparation of the soil, a sandy to a clay loam, was the same as that for the Indian corn which is described above. The sets were planted May 21 in rows two and one-half feet apart and about a foot apart in the rows. They were all dug on October 11 and the yield in each case was computed from two rows, each 66 feet long. No rot was observed in any of the varieties.

POTATOES—Test of Varieties (non-irrigated).

Number.	Name of Variety.	Average Size.	Total Yield per Acre.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Empire State	Small	198	0	92	24	105	36	Oval, white.
2	Late Puritan	Medium	182	36	114	24	68	12	"
3	Vick's Extra Early	Small	172	42	99	0	73	42	Irregular, pink.
4	Rochester Rose	"	169	24	103	24	66	0	Oval, pink.
5	Gold Coin	Medium	165	0	121	0	44	0	Round & oval, white
6	Holborn Abundance	Small	162	48	103	24	59	24	Round, white.
7	Reeves' Rose	Medium	160	36	79	12	81	24	Oval, pink.
8	Morgan Seedling	Small	160	36	83	36	77	0	Irregular, pink.
9	Irish Cobbler	Medium	159	30	110	0	49	30	Round, white.
10	Carman No. 1	"	158	24	110	0	48	24	Oval, white.
11	State of Maine	"	149	36	94	36	55	0	Oval & round, white
12	American Wonder	Small	149	36	81	24	68	12	Oval, white.
13	Money Maker	Medium	148	30	93	30	55	0	Flat, oval.
14	Dreer's Standard	Small	148	30	103	24	45	6	Round, white.
15	Ashleaf Kidney	"	138	36	92	24	46	12	Oval, white.
16	Everett	Medium	136	24	55	0	81	24	Oval, pink.
17	Early Manistee	"	129	48	72	36	57	12	Flat, round, pink.
18	Dooley	Small	123	12	72	36	50	36	Round, white.
19	Dalmeny Beauty	Medium	74	48	30	48	44	0	" "

ALFALFA OR LUCERNE.

Several plots of alfalfa were sown on backsetting, without a nurse crop, in the spring of 1908. The plants were clipped off once during the summer and were left on the ground, but the growth was not large. Our results from these dry-land plots this season have been quite encouraging, as will be noted from the following table. The weights given are for the cured hay as it was hauled into the barn. The first cutting was made June 28 and the second cutting was made August 13. Size of each plot, one-fourth acre, part of which was inoculated in 1908 and the balance of each plot was left untreated.

ALFALFA—(non-irrigated).

Amount of seed per Acre.	Inoculated. First Cutting.	Inoculated. Second Cutting.	Inoculated. Total for Season.	Not Inoculated. First Cutting.	Not Inoculated. Second Cutting.	Not Inoculated. Total for Season.
Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
5	5,355	980	6,335	4,320	630	4,950
10	5,425	875	6,300	3,285	468	3,755
15	4,690	980	5,670	3,375	360	3,735
20	3,955	980	4,935	3,015	495	3,510

Average yield per acre of the four plots for the season, 5,810 lbs., inoculated; 3,988 lbs., not inoculated.

The average increase in yield for the season, due to inoculation, was 1,822 lbs. per acre.

From the table two interesting points are brought out: First, that the plots where the seed was sown at the rate of 5 and 10 pounds per acre yielded heavier than those where the seed was sown at the rate of 15 to 20 lbs. to the acre. It should be mentioned that on the irrigated Farm the results were just the reverse, *i.e.*, the plots receiving the lightest seeding gave the smallest yields of hay. The proper amount of alfalfa seed to sow on non-irrigated land has not yet been determined accurately, but ten or eleven pounds to the acre is probably not far from correct. In this experiment, five pounds to the acre gave the best results, but it must be borne in mind that it was sown under most favourable conditions, as the seed bed was in exceptionally fine condition and opportune rains followed so that all the seeds had a good chance to germinate and grow.

The second point of particular interest brought out by the table, is the large increase, amounting on the average to nearly a ton to the acre during the season, in the crop obtained from the portion of the plot that had been inoculated with soil from an old alfalfa field in the spring of 1908, when the seed was sown. Many farmers are under the impression that it is necessary to inoculate the land to get a good stand of young alfalfa, but this is not the case. The seed comes up quite as well on land that is not inoculated as on land that is. The second season, however, the effect of inoculation is noticeable, for on land not treated the plants almost invariably become less thrifty, as indicated by their yellowish or light green appearance, and do not usually assume a normal vigorous growth until the end of perhaps the third season.

That the hay problem is one that is confronting every farmer on non-irrigated land in Southern Alberta is quite freely admitted and it is certainly worth his while to give it careful consideration. Alfalfa is without doubt the most promising forage plant that has been tested so far, and every farmer should give it a careful trial. One hundred pounds of inoculated alfalfa soil will be supplied gratis to any farmer in Southern Alberta who will apply to this Farm for it, the recipient paying the freight from Lethbridge. A circular dealing quite fully with alfalfa growing will be mailed free to any one who will apply for it.

Some alfalfa was planted in the spring of 1908, in rows 28 inches apart, which was cultivated twice with an ordinary garden cultivator during the summer of 1908. It was planted in this maner with a view of raising seed. A small plot on one side of this plot was cut for hay this summer. Two crops were obtained. The first yielded at the rate of two tons 140 pounds per acre and the second yielded a few pounds less than a ton to the acre or a total for the season of three tons 120 pounds per acre. The yield of seed from that allowed to ripen was about 90 pounds per acre. Even this light yield at the present high price of the seed (and there is little likelihood of it being much cheaper), makes a profitable crop. Further investigations along this line are being carefully carried out. A larger area consisting of about 3¾ acres was sown in June, 1909, in rows for the production of seed next year, and an excellent stand was obtained.

About 6 acres of new land was seeded down with alfalfa in the ordinary way on June 12 and a good stand was obtained.

CLOVER.

A small plot of Red clover was planted in May, 1908, without a nurse crop on backsetting. It was cut July 28, 1909, and yielded at the rate of 1,600 pounds per acre. A plot of Alsike clover planted at the same time and in the same way yielded at the rate of 900 pounds per acre. There was a small amount of winter-killing in both of these plots. White clover, planted under the same conditions in 1908, winter-killed very badly and there was not enough left to make it worth while cutting this year.

BROME GRASS.

One-half acre of Brome grass was planted in the spring of 1908 on backsetting. One cutting was made July 28, 1909, which yielded at the rate of one ton and 1,050 pounds per acre.

WESTERN RYE GRASS.

One-half acre of Western Rye grass was planted in the spring of 1908 on backsetting. One cutting was made July 28, 1909, which yielded at the rate of two tons and 250 pounds per acre.

TIMOTHY.

One-quarter acre of timothy was planted under the same conditions as the above grasses. It was cut July 28, 1909, and yielded at the rate of one ton and 440 pounds per acre.

SUMMARY OF CROPS GROWN EXCLUSIVE OF UNIFORM TEST PLOTS (NON-IRRIGATED.)

	Bush.
Winter wheat	471
Spring wheat	267
Oats	201
Barley	22
Rye	13
	974

	Tons.
Hay, mixed	6¼
Oats, cut green for feed	8
Native hay from uncultivated area	5
	19¼

SMALL FRUITS (NON-IRRIGATED.)

In the spring of 1909, permanent plantations of red, white and black currants, gooseberries and raspberries were set out. The currants and gooseberries were set 6 feet apart each way. The raspberries were planted in double rows which were seven feet apart and the plants were set three feet apart in the row. Most of the plants put out established themselves well. The following list gives the names of the varieties and the number of each set out. All the raspberries were bent over and covered with earth before winter set in.

RED CURRANTS.

Number set Out.	Variety.	Number set Out.	Variety.
3	New Red Dutch.	2	Victoria Red
1	Fay's Prolific.	3	Red Grape.
3	Raby Castle.	3	Greenfield.
3	La Conde.	2	Rankin's Red.
1	Col. Wilder.	2	Cumberland.
3	Long Bunch Holland.	2	Red English.
3	Large Red.	1	Frauendorfer.
2	Moore's Seedling.		

WHITE CURRANTS.

3	Kaiser.	3	Large White.
3	Verrier's White.	3	Large Brandenburg.
3	White Cherry.	3	White Grape.
3	White Pearl.	3	Wentworth Leviathan
3	Climax.	2	White Dutch.

BLACK CURRANTS.

3	Topsy.	3	Success.
3	Eclipse.	3	Merveille de la Gironde.
3	Ethel.	3	Saunders.
3	Ontario.	3	Bang Up.
3	Magnus.	3	Climax.
3	Beauty.	3	Winona.
3	Monarch.	3	Eagle.
3	Norton.	3	Kerry.

GOOSEBERRIES.

3	Pearl.	3	Whitesmith.
3	Downing.	3	Smith's Improved.
3	Red Jacket.		

RED RASPBERRIES.

10	Early King.	10	Sunbeam.
10	Sarah.	10	Herbert.
8	Marlborough.	8	Cuthbert.
11	London.		

BLACK CAPS

10	Kansas.	8	Cumberland.

BLACKBERRIES.

10	Eldorado.	10	Snyder.
10	Shaffer's Colossal (violet),		

APPLE ORCHARDS (NON-IRRIGATED).

The following is a list of the varieties of apples and the number of each sort set out in the spring of 1908. In the second column, the number living in the summer of 1909 is given.

CROSS BREDS.

Variety.	Number Set.	Number alive in 1909.	Variety.	Number Set.	Number alive in 1909.
Aurora	2	1	Norman	4	4
Bow	4	2	Novelty	2	2
Carleton	1	1	Pioneer	4	2
Charles	2	1	Prince	4	2
Cowley	2	1	Progress	2	1
Eve	2	1	Robin	4	2
Jewel	4	3	Silvia	4	2
Magnus	4	4	Tony	4	2
Mecca	2	2			

SEEDLINGS OF CROSS-BREDS.

Alberta	5	2	Eva	5	2
Betty	5	2	Golden	5	3
Bow	3	3	Magnus	5	4
Charles	5	3	Pioneer	3	3
Cowley	5	5	Robin	5	1
Dawn	5	2	Sylvia	4	4
Elsa	4	4	Tony	5	3

STANDARDS AND CRABS.

Alexander	1	1	Longfield	2	1
Arcola	2	1	Lowland Raspberry	2	2
Baxter	1	1	Lyman Crab	2	2
Beaver	2	2	Melinda	2	2
Bison	2	2	Marmalade	1	1
Bomba	2	2	McIntosh Red	2	2
Bowie	2	1	McMahon White	2	2
Calumet	1	1	Mentor	1	1
Canadian Baldwin	1	1	Melfort	1	0
Carlisle	2	2	Milwaukee	2	2
Charlamoff	2	2	Minnesota Hybrid	2	2
Cottage	2	1	Murillo	2	2
Crescent	1	1	Nestor	1	0
Dart	2	1	Okabena	2	1
Dauphin	1	1	Osler	1	1
Dewar	2	1	Otter	2	2
Duchess	3	3	Panoka	2	2
Dudley	2	2	Parma	2	2
Earliana	2	2	Patten's Greening	2	2
Early Strawberry	2	2	Peerless	2	2
Excelsior Crab	2	2	Ramosa	1	0
Florence	2	2	Roslin	2	2
Galena	1	1	Rupert	4	4
Grand St. Jean	1	1	Scott's Winter	3	3
Hanley	2	2	Simbirsk	4	4
Hare Pipka	1	0	Stone	2	1
Hibernal	4	3	Sugar Miron	2	2
Hyslop Crab	2	2	Transcendent	2	2
Jasper	1	1	Wealthy	4	4
Lubsk Queen	2	2	Wesley	1	1
Langford Beauty	3	3	Whitney Crab	4	4
La Victoire	4	4	Winter Rose	2	2
Lead of St. Petersburg	2	2	Wolf River	2	2
Leroy	1	0	Yellow Transparent	2	2

NEW VARIETIES SET OUT IN 1909.

One specimen each of three new cross-breds, Sampson, Fairfield, Rideau.

PART II.—THE IRRIGATED FARM.

WINTER WHEAT.

No winter wheat was tested this season under irrigation.

EXPERIMENTS WITH SPRING WHEAT.

Five varieties of spring wheat were sown on April 26 at the rate of about one and one-half bushels to the acre in plots of one-sixtieth acre each. The land was broken the previous June but was not backset. The character of the soil was a sandy to a clay loam. The plots were irrigated once, on July 10. No rust was observed.

SPRING WHEAT—Test of Varieties (irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches	Inches		Lbs.	Bush.	Lbs.	Lbs.
1	Percy A	August 20	116	36	3	Beardless	2,460	43	0	65
2	Preston	" 20	116	36	2½	Bearded	2,940	41	0	64
3	Huron	" 17	113	34	3	"	2,580	39	0	65
4	Red Fife II ..	" 20	116	32	2⅓	Beardless	1,980	37	0	64
5	Stanley	" 17	113	38	3	"	3,580	34	0	63

SPRING WHEAT—RATES OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre each; they were sown April 16. The plots were put in on sod both years. In 1908, the land had been broken and backset the previous summer; in 1909, the land had been broken the previous June but had not been backset. The variety used both years has been Red Fife. One irrigation was given, on July 10.

SPRING WHEAT—Rates of Seed per acre (irrigated).

Amount of Seed.	Date of Ripening.	Yield 1909.		Average Yield for two Years.	
Lbs.		Bushel	Lbs.	Bushels	Lbs.
15	August 28	35	0	32	30
30	" 26	29	20	32	30
45	" 23	33	20	33	55
60	" 23	29	20	34	40
75	" 23	36	0	38	0
90	" 22	38	0	38	25
105	" 22	38	40	38	15
120	" 22	38	30	34	25

The high yield of , bushels obtained this season from 15 pounds of seed is probably caused by some exceptional condition in the soil of the plot, as this amount is so at variance with the other yields.

SEED SELECTION EXPERIMENT.

To test the possibility of breeding a strain of Red Fife wheat that could be grown on irrigated land and yet be more free from the 'yellow berry' than at present, the following experiment was inaugurated. In May, 1909, fifty kernels of Red Fife were carefully selected, showing no trace of 'yellow berry' and at the same time ten kernels were selected that showed a decidedly starchy appearance. These were planted in the garden on well fertilized soil and in a place where they would be wet whenever any portion of the garden was irrigated. They were planted in rows three feet apart and each kernel was placed six to eight inches apart in the rows. Thorough cultivation was given the plants during the summer. Forty-seven out of the fifty selected kernels produced plants and, of the ten 'yellow berries' planted, nine plants were obtained. Of the forty-seven, three plants ripened August 30, twenty-six on September 2, and eighteen on September 11. The other set of nine plants ripened about the same time.

Each plant was harvested by itself when the majority of the heads were ripe, and was stored away in the barn but, unfortunately, mice damaged all the plants more or less. However, some seeds were threshed from each plant.

Of the lots of grain from the forty-seven plants, grown from seed free from 'yellow berry,' fifteen showed the presence of 'yellow berries' while in thirty-two none could be found. Of the nine plants grown from seed composed of kernels that would be called 'yellow berries,' five showed the presence of yellow berries, while in four none could be found. Expressed in per cent:—

Seed free from 'yellow berry' produced 32 per cent 'yellow berry' kernels.
Seed not free from 'yellow berry' produced 56 per cent 'yellow berry' kernels.

This would indicate that, by selecting seed from only those plants which produce no 'yellow berries,' one could, in time, breed a strain that would be less apt to produce 'yellow berries' under conditions conducive to the production of this less desirable quality in the grain. On account of the mice destroying so much of the grain, it was impossible to get an idea of the yields from the various plants, consequently, in selecting seed for the season of 1910, a preference was given to those plants which ripened earliest, although at least two kernels were taken from each of the twenty plants that were ripe by September 2 and which produced no 'yellow berries' and none were saved from those which ripened September 11.

EXPERIMENTS WITH OATS.

Six varieties of oats were sown on April 23 at the rate of about two bushels and two pecks per acre in plots of one-sixtieth acre each. The land was broken the previous June, but was not backset. The character of the soil was a sandy to a clay loam. The plots were irrigated once, on July 10. No rust was observed.

OATS—Test of Varieties (irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches			Lbs.	Bush.	lbs.	Lbs.
1	Improved American..	August 17	116	38	6½	Branching	3,060	90	0	41
2	Irish Victor..	" 16	115	34	6½	"	2,580	82	32	43
3	Abundance ..	" 19	118	35	5½	"	2,400	79	14	42½
4	Banner......	" 19	118	34	6	"	2,580	77	22	40
5	'Regenerated' Abundance.	" 17		36	5½	"	2,550	75	0	
6	Danish Island	" 16	115	32	6	"	2,340	72	12	40
7	Sixty Day. ..	" 10	109	30	5½	"	1,740	63	18	

OATS—FIELD LOTS.

A field of 15½ acres was broken from the prairie sod in June of 1908 and during that summer was double-disced twice and harrowed. Banner oats were sown this year at the rate of 95 pounds of seed per acre. The seeding began April 26, but, owing to a storm, could not be finished till May 4. The grain was irrigated once between July 12 and 15. The field was ripe August 21 and yielded at the rate of 70 bush. and 17 lbs. per acre.

One acre of land prepared in just the same manner as described for the above field, was divided and one-half of it was sown with Garten's 'Regenerated' Abundance oats on May 4 at the rate of 110 pounds of seed per acre. The other half-acre was sown with Banner oats on May 5 at the rate of 95 lbs. of seed per acre. One irrigation was given on July 12. Both fields ripened at the same time and were cut August 20. Garton's 'Regenerated' yielded at the rate of 58 bushels and 28 pounds per acre, and Banner oats at the rate of 77 bushels and 22 pounds per acre.

OATS—RATE OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre each; they were sown April 16. The plots were put in on sod both years. In 1908, the land had been broken and backset the previous summer; in 1909, the land had been broken the previous June, but had not been backset. The variety used the first season was Tartar King and this season Banner. One irrigation was given, on July 10.

OATS—Rates of Seed per Acre (irrigated).

Amount of Seed.	Date Ripe.	Yield in 1909.		Average for two Years.	
Lbs.		Bushels	Lbs.	Bushels	Lbs.
15	August 26	91	0	75	27
30	" 22	89	14	70	20
45	" 17	84	24	73	8
60	" 17	87	22	78	18
75	" 17	88	8	81	16
90	" 16	93	18	78	28
105	" 16	94	4	81	6
120	" 16	82	12	74	14

EXPERIMENTS WITH BARLEY.

Four varieties of six-rowed and two varieties of two-rowed barley were sown on May 7 at the rate of about one bushel and three pecks per acre, in plots of one-sixtieth acre each. The land was broken the previous June, but was not backset. The character of the soil was a sandy to a clay loam. The plots were irrigated once during the season, on July 10. No rust was observed.

SIX-ROWED BARLEY—Test of Varieties (Irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw, including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.	Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Claude. ..	Aug. 16	101	32	2½	Bearded	2,340	63	36	57
2	Odessa.......	" 16	101	30	2	"	1,980	61	12	56
3	Mansfield.....	" 16	101	34	2	"	1,980	58	36	56
4	Mensury.....	" 13	98	32	2½	"	2,220	53	36	54

TWO-ROWED BARLEY—Test of Varieties (Irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw, including Head.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.	Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Swedish Chevalier......	Aug. 19	104	31	3	Bearded	2,400	68	36	57
2	Standwell....	" 17	102	33	2	"	2,700	64	18	57

FIELD LOTS OF BARLEY

A field of one and one-eighth acres of Mensury barley was sown on May 7 at the rate of about two bushels per acre, on sod land, broken in June, 1908, but not backset. The field was irrigated once on July 13 and was ripe August 14. It yielded at the rate of 42 bushels and 2 pounds per acre.

BARLEY—RATE OF SEED PER ACRE.

In this experiment, the size of the plots used was one-twentieth acre each, they were sown May 7. The land was sod, broken in June, 1908, but not backset. They were irrigated once, on July 11.

MENSURY BARLEY—Rates of Seed per Acre (Irrigated).

Amount of Seed.	Date of Ripening.	Yield, 1909.		Average for 2 Years.	
lbs.		Bush.	Lbs.	Bush.	Lbs.
15	Aug. 17	40	20	36	12
30	" 17	44	28	40	0
45	" 17	45	20	41	22
60	" 17	46	32	43	6
75	" 13	51	12	44	8
90	" 9	47	24	43	16
105	" 7	42	24	38	26
120	" 7	47	24	41	12

EXPERIMENTS WITH PEAS.

Sixteen varieties of peas were sown on April 23 in plots of one-sixtieth acre each at the rate of about two to two and a half bushels to the acre, depending on the size of the pea. The land was broken the previous June, but was not backset. The character of the soil was a sandy to a clay loam. The plots were irrigated once during the season, on July 10.

PEAS—Test of Varieties (Irrigated).

No. of Plot.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Average Length of Straw.	Average Length of Pod.	Size of Pea.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.	Inches.		Bush.	Lbs.	Lbs.
1	Wisconsin Blue..	Aug. 24..	123	40	2½	Small.	31	0	64½
2	Daniel O'Rourke	" 19 .	118	36	2½	"	28	30	64½
3	Gregory.........	" 31..	130	50	3	Medium.. ..	24	0	64
4	Golden Vine..........	" 17..	116	34	2	Small......	23	30	64½
5	Early Britain...... .. .	" 19..	118	34	3	Large	23	0	63
6	English Grey....... ..	" 19..	118	32	2	Medium.. ..	19	30	64½
7	Chancellor............	" 11..	111	32	2	Small......	19	30	64½
8	Arthur	" 11..	111	30	2	Medium....	19	30	65¼
9	Paragon	" 28..	127	36	2	" ...	18	30	62½
10	White Marrowfat.. ...	" 30..	129	32	2½	Large	17	0	63
11	Mackay...	" 24..	123	30	2½	"	16	30	64¼
12	Black-eye Marrowfat..	" 24..	123	36	3	"	15	0	
13	Prince............ ..	" 17..	116	30	2	Medium.. ..	13	30	64
14	Victoria	" 28..	127	30	2	Large	13	0	64
15	Picton...............	" 19..	118	33	2	"	12	0	64½
16	Prussian Blue.........	" 17..	116	30	2½	Medium.. ..	11	0	65¼

INOCULATION FOR PEAS.

The yields of peas, for the two seasons that they have been tested on this Farm, have not been at all satisfactory. The growth of the vines has not appeared to be as vigorous as would be expected from the fertile condition of the soil in which the peas have been planted. To ascertain what effect, if any, inoculation of the seed or the soil in which the peas were planted would have, the following test was carried out. A small bottle of nitro-culture for peas was supplied by Mr. Shutt, the Chemist of the Experimental Farms, and a few pounds of soil in which peas had been grown the previous season was obtained from the Brandon Experimental Farm and also from a farm near Kingston, Ont. Some of this inoculating material was received late in the season so the plots were not planted till June 9. The peas were sown broadcast and raked in. Failing to get sufficient rain to bring the seed up, it was necessary to flood-irrigate it, which caused the surface soil to bake badly, consequently the young plants had a poor start and were too late to ripen seed. Very small plots were used and they were not of uniform size; however, they were large enough to allow the character of growth to be easily observed. Before irrigating, a bank of earth was thrown up around each plot 8 or 10 inches high and only enough water was allowed on each plot at one time to cover it three or four inches deep. None of the water from one plot was allowed to reach any of the other plots in order to prevent any possibility of carrying the inoculating bacteria in the water from one plot to another. By the time the plants were 10 inches to a foot high, there was a decided difference in the colour of the foliage between the plots treated and the untreated check-plot. In the latter part of September the vines were cut and the yields of these when cured is given in the following table:—

PRUSSIAN BLUE PEAS—Inoculation test (Irrigated).

Plot No.		Area.	Weight of cured Vines.	Yield per acre of cured Vines.	Increase per acre in Yield over Check Plot.
		Acres.	Lbs.	Lbs.	Lbs.
1	Check-plot untreated........	$\frac{1}{193}$	25	2,325	
2	Culture from Ottawa..	$\frac{1}{403}$	10	4,030	1,705
3	Soil from Brandon................	$\frac{1}{189}$	25	4,725	2,400
4	Soil from Ontario..	$\frac{1}{195}$	22	4,290	1,965

It is unfortunate that the crop was so late that seed could not mature, so that the actual increase in yield could be determined, but the marked difference in the weights of vines between plots treated and the check plot left untreated is significant. The results are sufficiently encouraging to warrant one in expecting encouraging results along this line in tests that are planned for the season of 1910.

EXPERIMENTS WITH INDIAN CORN.

Although abundant yields of alfalfa hay may be obtained from irrigated land, still, corn raised for fodder, to be used in the green state to supplement the dry pastures of August and September where milch cows are kept, or to be cured in the shock and fed later in the dry condition or to be stored in a silo, is of much importance on account of the fact that corn fodder, fed in conjunction with alfalfa hay, gives a much better balanced ration than this hay fed alone. Especially is this the case for milch cows. Again, if the supply of alfalfa is limited, a large quantity of rough feed can be produced economically by planting corn on well-prepared land.

INDIAN CORN—Test of Varieties.

Seventeen varieties of Indian corn were planted May 26 on land from which a crop of seedling Caraganas had been raised in 1908. During the winter, manure from the Canadian Pacific Railway stockyards was applied at the rate of about twelve loads per acre and was ploughed under in the spring. The soil was a sandy to a clay loam. Two rows of each variety were planted in hills with three feet between rows, and another two rows of each variety planted with the seed a few inches apart in the row. The crop was irrigated on July 20 and on August 23. The varieties were all cut September 7. The yield of green fodder per acre in each case was computed from two rows, each 66 feet long.

INDIAN CORN—Test of Varieties (Irrigated).

Number.	Name of Variety.	Height.	Leafiness.	Condition when Cut.	Weight per acre grown in Rows.		Weight per acre grown in Hills.	
		Inches.			Tons.	Lbs.	Tons.	Lbs.
1	Early Mastodon....	64	Extra good .	In silk..........	15	1,130	8	1,600
2	Superior Fodder	58	" .	Barely in silk...	12	1,850	8	1,380
3	Mammoth Cuban......	60	" .	Tasselled.......	12	1,300	6	430
4	Compton's Early	66	Good.......	In silk..........	11	1,430	8	830
5	Eureka	63	"	"	10	1,780	6	1,200
6	Longfellow.....	66	Fair...... .	Very early milk.	10	1,560	6	1,200
7	Salzer's All Gold..	50	Extra good .	Tasselled.......	9	700	6	430
8	Selected Leaming...........	58	Medium	Barely in milk..	9	700	6	430
9	Angel of Midnight	60	"	In silk..........	9	150	7	630
10	White Cap Yellow Dent.....	60	Extra good..	"	8	1,600	4	1,680
11	Wood's Northern Dent	60	Fair..	"	8	1,600	6	1,750
12	Triumph......	58	" .. . :	Starting to silk.	8	1,160	7	1,730
13	North Dakota White	60	Medium....	In silk..........	8	330	7	630
14	Champion White Pearl......	55	"	Starting to silk..	7	1,400	7	300
15	Mercer.....	60	"	Tasselled.....	7	630	8	1,050
16	Northwestern Dent	65	Poor to fair.	In silk..........	6	650	6	430
17	Davidson	58	Medium ...	"	6	320	5	310

EXPERIMENTS WITH FIELD ROOTS.

Under irrigation, it is possible to obtain very large yields of all kinds of roots, especially if a proper rotation is followed coupled with the judicious use of manure. The preparation of the land in which the roots were planted was just the same as that of the Indian corn, *i.e.*, manure from the Canadian Pacific Railway stockyards was applied during the winter at the rate of about twelve loads to the acre and was ploughed under in the spring.

EXPERIMENTS WITH TURNIPS.

TEST OF VARIETIES.

Eleven varieties were tested on a sandy to a clay loam, and two plantings of each were made, the first on May 20 and the second on June 3. The rows were 30 inches apart and the young plants were thinned to about ten or twelve inches apart in the row. The crop was irrigated five times, on July 6, 17, 20, 26, and on August 4. The yield in each case was computed from the weight of roots from two rows, each 66 feet long. They were all pulled on October 10.

TURNIPS—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Clyde	25	160	836	0	14	380	473	0
2	Skirving's	24	840	8[illegible]	0	16	1,660	561	0
3	Halewood's Bronze Top	23	860	781	0	15	1,680	528	0
4	Perfection Swede	21	1,560	72[illegible]	0	9	1,800	330	0
5	Carter's Elephant	21	240	701	0	12	420	407	0
6	Kangaroo	20	1,580	693	0	15	1,020	517	0
7	Jumbo	20	920	682	0	13	400	440	0
8	Hall's Westbury	19	280	638	0	10	460	341	0
9	Magnum Bonum	18	960	616	0	12	1,080	418	0
10	Good Luck	16	1,000	550	0	12	420	407	0
11	Bangholm Selected	16	340	539	0	12	24	400	24

MANGELS.

TEST OF VARIETIES.

Ten varieties were tested on a sandy to a clay loam, and two plantings of each were made, the first on May 8 and the second on May 25. The rows were 30 inches apart and the young plants were thinned to about ten to twelve inches apart in the row. The crop was irrigated five times on July 6, 17, 20, 26, and on August 4. The yield in each case was computed from the weight of roots from two rows, each 66 feet long. They were all pulled on October 8.

MANGELS—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Half Sugar White	24	840	814	0	15	1,284	521	24
2	Gate Post	23	200	770	0	17	1,640	594	0
3	Crimson Champion	22	880	745	0	13	1,060	451	0
4	Mammoth Red Intermediate	22	220	737	0	15	96	501	36
5	Giant Yellow Intermediate	21	900	715	0	15	1,020	517	0
6	Giant Yellow Globe	20	920	682	0	14	1,700	495	0
7	Yellow Intermediate	18	300	605	0	16	1,792	563	12
8	Perfection Mammoth Long Red	17	1,640	594	0	13	1,060	451	0
9	Prize Mammoth Long Red	17	1,640	594	0	12	1,344	422	24
10	Selected Yellow Globe	16	340	539	0	15	1,020	517	0

CARROTS.

TEST OF VARIETIES.

Five varieties were tested on a sandy to a clay loam, and two plantings of each were made, the first on May 8 and the second on May 25. The rows were 20 inches apart and the young plants were thinned to about six inches apart in the rows. The crop was irrigated five times, on July 6, 17, 20, 26, and August 4. The yield in each case was computed from the weight of roots from two rows each 66 feet long. They were all pulled on October 8.

CARROTS—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	14	1,700	495	0	5	1,880	198	0
2	Half Long Chantenay	13	1,720	462	0	7	850	247	30
3	White Belgian	12	750	412	30	7	1,048	250	48
4	Improved Short White	12	750	412	30	6	870	214	30
5	Mammoth White Intermediate	6	1,860	231	0	1	1,564	59	24

SUGAR BEETS.

TEST OF VARIETIES.

Four varieties were tested on a sandy to a clay loam, and two plantings were made of the first three on May 10 and on May 25. Only one planting was made from the seed obtained from Raymond, on May 25. The rows were 20 inches apart and the young plants were thinned to about six inches apart in the row. The crop was irrigated five times, on July 6, 17, 20, 26, and on August 4. The yield in each case was computed from the weight of roots from two rows, each 66 feet long. Average specimens of roots from each variety was sent to the Chemist of the Experimental Farms Mr. Frank T. Shutt, Ottawa, carefully wrapped in oil paper to prevent, as much as possible, any loss of moisture. The results of his analysis in regard to the per cent of

sugar in juice is given in the last three columns of the table. They were all harvested on October 8.

SUGAR BEETS—Test of Varieties (Irrigated).

Number.	Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.		Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	p. c.	p.c.	
1	Klein Wanzleben........	24	1,500	825	0	21	1,560	726	0	17·74	19·49	91·5
2	French, Very Rich.......	24	510	808	30	19	1,600	660	0	17·64	19·17	92·0
3	Vilmorin's Improved ...	24	520	808	30	17	1,640	594	0	18·59	20·24	91·8
4	Klein Wanzleben (Raymond Seed).	....		....		18	630	610	30	17·68	19·69	89·7

EXPERIMENTS WITH POTATOES.

TEST OF VARIETIES.

Twenty varieties were planted on a sandy to a clay loam on May 21. The rows were 30 inches apart and the sets were placed about a foot apart in the rows. The crop was irrigated four times, on July 17, 26, August 4 and 24. They were dug on October 11 and the yield in each case was computed from the weight of potatoes obtained from two rows each 66 feet long. There was no rot observed in any of the varieties.

POTATOES—Test of Varieties (Irrigated).

Number.	Name of Variety.	Average Size.	Total Yield per Acre.				Yield per Acre. Marketable.		Yield per Acre. Unmarketable		Form and Colour.
			Tons.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	State of Maine.	Large	19	808	646	48	638	0	8	48	Oval, white.
2	Empire State	"	18	1,092	618	12	598	24	19	48	Long "
3	Irish Cobbler.....	"	18	300	605	0	572	0	33	0	Flat "
4	Morgan Seedling.	Medium. .	17	244	587	24	572	0	15	24	Long, pink.
5	American Wonder......	Large	17	56	567	26	539	0	28	36	" white.
6	Rochester Rose..........	Medium. .	15	1,284	521	24	484	0	37	24	" pink.
7	Money Maker............	Large ...	15	1,020	517	0	499	24	17	36	Round, white.
8	Vick's Extra Early	Medium. .	15	624	510	24	466	24	44	0	Flat "
9	Late Puritan.........	Large	13	1,588	459	48	429	0	30	48	Long, pink.
10	Holborn Abundance	Medium. .	13	268	437	48	385	0	52	48	Round, white.
11	Everett............ ...	Large	12	1,608	426	48	385	0	41	48	Long, pink.
12	Dreer's Standard	" ..	12	1,344	422	24	396	0	26	24	Oval, white.
13	Dalmeny Beauty.........	" ...	12	288	404	48	360	48	44	0	"
14	Early Manistee..........	Medium. .	12	156	402	36	369	36	33	0	Flat, pink.
15	Gold Coin...	Large ...	11	308	371	48	358	36	13	12	Round, white.
16	Carman No. 1..........	"	11	176	369	36	352	0	17	36	Flat "
17	Ashleaf Kidney..........	"	11	176	369	36	338	48	30	48	Oval "
18	Reeve's Rose	Medium. .	10	856	347	36	308	0	39	36	Long, pink.
19	Dooley..	Large	8	1,160	286	0	264	0	22	0	Round, white.
20	Uncle Gideon's Quick Lunch	Medium. .	6	804	213	84	184	48	23	36	" pink.

FORAGE CROPS (IRRIGATED).

ALFALFA OR LUCERNE.

Alfalfa is, without doubt, the most profitable field crop that has yet been raised on irrigated land in Southern Alberta, and every owner of such land should make a strenuous effort to get in a large acreage as soon as possible. Space will not be taken up here to give any details in regard to the growing of this plant, but a circular dealing with the matter quite fully will be mailed free to any one applying for the same.

On account of not having any old land, it was not thought advisable to plant a very large acreage of alfalfa in the season of 1908, but in the latter part of May of that year a few acres were sown. One of the experiments was to determine the best quantity of seed to sow per acre. The following table gives the results obtained during the season of 1909. It would be only fair to mention that a fine stand was obtained, as, just after sowing, very timely rains came and practically every seed grew, which is a condition that cannot be always relied upon. This should be borne in mind in studying the results. The plots were irrigated on July 3 to 5 after the first cutting was made, again on August 12 to 14 after the second cutting was made, and in the fall between October 1 and 4 to insure plenty of moisture being in the ground through the winter and in the spring.

ALFALFA—Rates of Seed (Irrigated).

Rate of Seed sown.	1st Cutting June 21.		2nd Cutting Aug. 4.		3rd Cutting Sept. 13.		Total Yield for Season.	
Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
5	1	1,840	2	1,000	1	220	5	1,060
10	2	200	2	1,280	1	1,040	6	520
15	2	680	2	1,480	1	1,180	6	1,340
20	2	200	2	1,680	1	1,220	6	1,100
25	2	0	2	1,400	1	1,280	6	680
30	2	280	2	1,520	1	1,200	6	1,000

The second cutting was not cured quite as dry as it might have been before it was hauled to the barn, consequently the yield on the second cutting for all of the plots is a trifle high. As mentioned above, an extremely good stand was obtained on account of the timely rains and of the seed bed being in such an ideal condition. As a rule, such conditions cannot be relied upon, so five or ten pounds of seed do not always give as good a stand as was here obtained. Observation and experience in this district would indicate that twenty pounds of seed on irrigated land is about the correct amount to sow.

ALFALFA—EXPERIMENTS WITH INOCULATION.

When the alfalfa was sown in May, 1908, the land was all inoculated except a small piece left untreated for a check plot, and the following table gives the effect of this use of soil from an old alfalfa field spread over the land just previous to sowing the seed. These plots were irrigated at the same time as the Rates of Seed plots were.

ALFALFA—Inoculation Tests (Irrigated).

	1st Cutting June 24.		2nd Cutting Aug. 4.		3rd Cutting Sept. 13.		Total Yield for Season.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Inoculated	2	700	2	50	1	1,050	5	1,800
Uninoculated		1,900	1	1,050	1	800	3	1,750
Increase due to inoculation							2	50

It might be well to call attention to the fact that an equally good stand was obtained on both these plots, whether they were inoculated or not, as the inoculation rarely affects the growth of the plants until the second season. When the last cutting was made, but little difference was noted in the colour and general appearance of the two pieces and it is anticipated that the piece that is uninoculated will be quite as good as the other next spring, because the irrigation water will have distributed the germs over the untreated plots.*

MIXTURES OF ALFALFA AND GRASSES.

Where alfalfa is sown with a mixture of grasses such as timothy, rye grass, &c., the hay can be cut only twice during the season instead of three times, owing to the fact that the grasses are not ready to cut until sometime in July, which allows time for only one more cutting to come on, while alfalfa when grown alone must be cut about the 25th of June if three cuttings are desired. After the grasses have been cut in July, they make little growth, so that the second cutting is practically pure alfalfa. The following table gives the results of three plots of one-quarter acre each, sown in 1908. They were irrigated three times during the season, on July 3 to 5, August 12 to 14, and October 1 to 4, the last to provide moisture for the winter.

MIXED HAY (irrigated).

	1st Cutting July 19.		2nd Cutting August 30.		Total Yield for Season.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Alfalfa and Timothy	1	1,620	1	920	3	540
Alfalfa and Rye Grass	1	1,800	1	1,840	3	1,640
Alfalfa, Timothy and Rye Grass	1	1,940	2	440	4	380

NEW SEEDINGS OF ALFALFA.

Seed of fourteen varieties or strains of Alfalfa was received from the United States Department of Agriculture, Washington, D.C. These were supplied by the courtesy of Mr. J. M. Westgate, Agronomist, Division of Forage, Crop Investigations.

* As stated in Part I., one hundred pounds of inoculated alfalfa soil will be supplied gratis to any farmer in the southern part of the province from the Lethbridge Experimental Farm. The recipient must pay freight charges.

They were sown without a nurse or cover crop on June 5 at the rate of about 20 pounds of seed per acre, in one-tenth and one-fortieth acre plots, depending on the amount of seed, except the *Medicago falcata,* of which there was only an ounce or so. A good stand was obtained on all the plots. The following is a list of the varieties, giving, as well, the climates of the regions where some of the more recent kinds were obtained.

VARIETIES OF ALFALFA.

Size of Plot. — Acre.	Number and Name.	Size of Plot. — Acre.	Number and Name.
1-10	25102 Grimm.	1-40	22789 from Tschimkent, Turkestan, average winters.
1-10	21032 Turkestan.		
1-10	23454	1-40	22790 from Khiva, Turkestan, mild winters.
1-10	23396 Sand Lucerne.		
1-10	23394 " "	1-40	23203 from Werny, Turkestan, very severe winters.
1-10	24836 Canadian (Purple Flowers).		
1-10	24837 " (Variegated).	1-40	22788 from Aulieata, Turkestan, severe winters.
1-10	24859		
1-40	25022 Old Frankish Lucerne.	1-300	24452 *Medicago falcata* (Yellow flowered).

It might be of interest to note that the last named alfalfa, the *falcata,* is a distinct species from the ordinary sort. It is quite hardy and, doubtless, the natural hybrids between this and the common purple flowered kind produce the hardy strains such as the Grimm, Sand Lucerne and others. The falcata itself is not valuable for hay on account of its stems not having an upright growth, but rather a tendency to lie prostrate or procumbent. However, in any portions of the province where ordinary alfalfa does not prove to be hardy, it is quite probable that some form of hybrid may be found that will be so. One of the easiest ways of recognizing one of these hybrids is in the variegated colourings of the blooms.

FIELD LOT OF ALFALFA (irrigated).

The last of May a field of about four acres was sown without a nurse crop at the rate of 20 pounds of seed per acre and a good stand was obtained.

TIMOTHY. *(Phlarum pratonse).*

A quarter-acre plot of this hay was sown in 1908. Part of it was given a light top-dressing of coarse, strawy manure in November, 1908, and the difference in the resulting yields is quite marked. The dates of irrigation for this plot are the same as for the plots of Alfalfa. The crop was cut July 19.

	Yield per acre. Tons.	Lbs.
Timothy top-dressed the previous fall	2	40
Timothy not top-dressed	1	1,200
Difference in yield		840

BROME GRASS. *(Bromus inermis).*

A half-acre plot was sown in 1908. Part of it was top-dressed the same as the timothy and it was also irrigated and cut at the same time as the former.

	Yield per acre. Tons.	Lbs.
Brome Grass top-dressed the previous fall	2	440
Brome Grass not top-dressed	2	0
Difference in yield		440

WESTERN RYE GRASS. *(Agropyrum tenerum).*

A half-acre plot was sown in 1908. Part of it was top-dressed the same as the brome and timothy plots. It was irrigated and cut at the same time they were.

	Yield per acre. Tons.	Lbs.
Western Rye grass top-dressed the previous fall	2	40
Western Rye grass not top-dressed	2	320
Difference in yield		290

SUMMARY OF CROPS GROWN EXCLUSIVE OF UNIFORM TEST PLOTS (IRRIGATED).

	Bush.
Wheat (spring)	35
Oats	1,383
Barley	82
	1,500

	Tons.
Hay, mixed	19
Oats, cut green for feed	4
Native hay from uncultivated area	4
	27

SMALL FRUITS (IRRIGATED).

In the spring of 1909, permanent plantations of red, white and black currants, gooseberries and raspberries were set out. The currants and gooseberries were set six feet apart each way. The raspberries were set in double rows which were seven feet apart and the plants were set three feet apart in the row. Most of the plants put out established themselves well. The following list gives the names of the varieties and the number of each set out. All the raspberries were bent over and covered with earth before winter set in. The plantation was irrigated early in July and again in October after growth had ceased. This last irrigation was to supply moisture for the winter.

RED CURRANTS.

Number set out.	Variety.	Number set Out.	Variety.
3	Champagne.	3	Pomona.
3	Cumberland.	3	Prince Albert.
3	Fay's Prolific.	3	Rankin's Red.
3	Frauendorfer.	3	Red English.
3	Greenfield.	3	Red Grape.
3	La Conde.	3	Red Dutch.
3	Large Red.	3	Raby Castle.
3	Long Bunch Holland.	3	Victoria Red.
3	Moore's Seedling.	3	Col. Wilder.
3	New Red Dutch.		

WHITE CURRANTS.

3	Verrier's White.	3	White Grape.
3	Wentworth's Leviathan.	3	White Kaiser.
3	White Brandenburg.	3	White Pearl.
3	White Cherry.	3	Large White.

BLACK CURRANTS.

3	Climax.	3	Magnus.
3	Eagle.	3	Merveille de la Gironde.
3	Kerry.	3	Monarch.
3	Lee's Prolific.	3	Ontario.
3	Norton.	3	Saunders.
3	Bang-Up.	3	Success.
3	Beauty.	3	Topsy.
3	Eclipse.	3	Winona.
3	Ethel.		

GOOSEBERRIES.

2	Carman.	3	Red Jacket.
1	Companion.	3	Smith's Improved.
3	Downing.	3	Whitesmith.
3	Pearl.		

RED RASPBERRIES.

12	Cuthbert.	12	Ruby Red.
10	Early King.	29	Sarah.
20	Herbert.	40	Sunbeam.
26	Loudon.	16	Golden Queen (yellow).
12	Marlboro.		

BLACK CAPS.

12	Cumberland.	10	Kansas.
5	Hilborn.		

BLACKBERRIES.

7	Conrath.	10	Snyder.
14	Eldorado.	10	Shaffer's Colossal (purple).

STRAWBERRIES.

A plantation of strawberries was set out in the spring of 1908. In the fall of that year there were some plants living of each of thirty-six different varieties. Two rows each 50 feet long were laid off for each sort but, owing to the fact that many of the plants were in a poor condition when received last year, an indifferent stand of most of the varieties was obtained, so that the yields this season from the

various sorts are of so little value as a basis of comparison that they are omitted. The plantation was mulched with straw during the winter. Thirty-five varieties fruited. The first fruit ripe was on the Beder Wood on July 4. On the 9th, pickings were made from the following varieties: August Luther, Wm. Belt, Ruby, Carrie, Fountain, Clyde and Senator Dunlap. Apparently, the Beder Wood and August Luther were the earliest varieties this season. The stands were too poor to gain a very satisfactory idea of the best yielding late sorts. One of the most promising varieties for general planting among those tested is the Senator Dunlap. This is a perfect-flowering sort and is a vigorous, strong grower. As there are plenty of young plants of all varieties that established themselves to set out a fresh plantation of the same size in 1910, it is hoped that a good even stand may be obtained when this is done, so that the relative yields, together with notes concerning their season, quality, &c., under our conditions, may be obtained.

APPLE ORCHARDS (IRRIGATED).

The following is a list of the varieties of apples and the number of each set out in the spring of 1908. In the second column the number living in the summer of 1909 is given.

CROSS BREDS.

Variety.	Number set Out.	Number alive in 1909.	Variety.	Number set Out.	Number alive in 1909.
Bow	4	3	Norman	4	3
Golden	1	1	Osman	1	1
Jewel	4	2	Pioneer	4	2
Josie	2	2	Robin	6	4
Kent	5	1	Silvia	6	4
Magnus	4	3	Tony	4	2

SEEDLINGS OF CROSS-BREDS.

Variety.	Number set Out.	Number alive in 1909.	Variety.	Number set Out.	Number alive in 1909.
Alberta	5	5	Golden	5	2
Betty	2	1	Madge	1	1
Bow	5	..	Magnus	3	3
Charles	5	4	Martha	1	1
Cowley	3	3	Pioneer	4	2
Dawn	3	2	Prince	5	4
Eva	3	2	Robin	5	3
Elsa	5	2	Tony	5	5

STANDARDS.

Variety.	Number set Out.	Number alive in 1909.	Variety.	Number set Out.	Number alive in 1909.
Arcola	2	..	Longfield	1	1
Bowie	2	..	Melinda	2	2
Charlamoff	2	..	McIntosh Red	2	1
Cottage	2	..	McMahon White	2	..
Dart	2	1	Milwaukee	3	3
Duchess	2	1	Panoka	2	2
Dudley	1	1	Patten's Greening	1	1
Early Raspberry	1	1	Robin	2	2
Excelsior Crab	2	2	Scott's Winter	2	1
Hanley	2	2	Stone	1	1
Hilborn	2	2	Transcendent Crab	1	1
La Victoire	2	2	Winter Rose Crab	2	2
Lead of St. Peterburg	1	1	Yellow Transparent	2	2

TREES AND SHRUBS (IRRIGATED.)

The following trees and shrubs were set out in the spring of 1907 in nursery rows and brief notes are given concerning their condition in the summer of 1908 after passing through the first winter and in 1909 after going through the second winter.

Reference Number.	No. set Out.	Name.
		Acer (Maple).
319½	2	A. pictum rubrum '09, all alive but killed back about half.
320	4	A. platanoides purpurea, '09, one alive and it only at the roots.
321	2	A. platanoides Schwedleri '09, only one alive, killed back.
329	6	A. saccharinum '08, four alive, killed back; '09, still alive, but killed to ground.
338	10	A. tataricum '08, thrifty; '09 tips killed back.
341	10	A. tataricum Ginnala '09, thrifty, perfectly hardy.
		Amelanchier (June Berry).
442	2	A. vulgaris '09, thrifty.
		Aristolochia (Birthwort).
1355	4	A. Sipho '08, dead.
		Artemisia (Southernwood).
1313	4	A. Abrotanum '09, starts from the base each season, thrifty.
		Berberis (Barberry).
501	6	B. Aquifolium '09, killed ⅔ back.
1206	2	B. canadensis '09, about half killed back.
1114	3	B. heteropoda '08, 1 alive; 09, ⅔ killed back.
895	30	B. Thunbergi '09, partly killed back.
		Betula (Birch).
18	18	B. alba, (white Birch), dead in '08.
385	4	B. alba laciniata pendula (Cut-leaved Weeping Birch) '08, thrifty; '09, hardy.
343	6	B. lutea, (Yellow Birch) '07, dead in fall.
		Calycanthus (Carolina Allspice).
1386	10	C. floridus '08, only two alive; '09, dead.
		Caragana (Siberian Pea Tree).
394	20	C. aborescens '08, thrifty; 09, thrifty.
	75	C. frutescens all living in '09, perfectly hardy.
836	6	C. mollis glabra '08, five alive; '09, thrifty.
569	2	C. Redowsky '09, hardy and thrifty.
912	4	C. pygmaea '09, thrifty.
571	1	C. spinosa '08, thrifty; '09, tips killed.
		Catalpa.
1504	6	C. Kaempferi '08, alive; '09, dead.
1010	4	C. speciosa '08, alive; '09, three alive at base.
		Celastrus (Shrubby Bitter-Sweet).
1550	1	C. scandens '08, killed back, '09; alive at base.
		Clematis (Virgin's Bower).
1406	6	C. integrifolia cærulea '08, 4 alive; '09, growing from base.
433	6	C. Vitalba '08, thrifty; '09, 4 alive and thrifty.
376	4	C. Viticella '08, 3 alive; '09, growing from base.

TREES AND SHRUBS (IRRIGATED)—*Continued.*

Reference Number.	No. set Out.	Name.
		Cornus (Dogwood).
515	10	C. alba sibirica variegata '08, 8 alive; '09, growing from base.
996	6	C. purpusa '08, alive; '09, badly killed back.
490	6	C. Spaethii aurea '08, 3 alive; '09 killed to base.
		Cotoneaster.
834	2	C. acutifolia '08, 1 alive; '09, killed half back.
477	2	C. bacillaris '09, 1 killed half back, other killed to base.
916	2	C. frigida '08, 1 alive; '09, killed ⅔ back.
896	2	C. nigra '08, dead.
407	2	C. tomentosa '08, 1 alive; '09, very thrifty.
988	2	C. vulgaris '09, ½ killed back.
		Crataegus (Hawthorn).
1251	4	C. Carrièri '07, 1 dead; '08, killed back; '09, alive at base.
1256	4	C. Arnoldiana '09, thrifty.
1223	3	C. Apiosa '07, 1 dead; '08, killed to base; '09, only one left and almost dead.
972	4	C. coccinoides '08, killed back slightly; '09, ⅔ killed back.
947	2	C. collina '08, 1 alive; '09, alive at base.
932	2	C. fecunda '08, dead.
905	3	C. spathulata '08, 2 killed back; '09, alive at base only.
1238	2	C. submollis '09, quite thrifty.
		Cytisus (Broom).
1260	2	C. hirsutus '09, killed back.
380	4	C. nigricans '07, 2 alive; '09, growing from base.
1055	2	C. triflorus '08, 1 alive; '09, alive at base.
		Elaeagnus (Olive).
19	20	E. angustifolia (Russian Olive) one dead fall of '07; in '08, 2 dead and all killed back more or less; '09, tips killed back.
930	1	E. umbellata '09, alive at base.
		Euonymus (Spindle Tree).
1217	6	E. bungeanus '09, two vigorous, other 4 killed to base.
872	6	E. linearis '09, thrifty, though a few tips killed.
563	6	E. sieboldianus '09, killed half back.
		Fraxinus (Ash).
918	4	F. mandshurica '09, thrifty but tips killed back.
		Gleditschia (Honey Locust).
831	20	G. triacanthos '08, all dead.
417	4	G. triacanthos inermis '08, killed back somewhat; '09, two dead but two only killed back slightly.
		Hydrangea.
468	6	H. paniculata grandiflora '08, 5 alive; '09, killed ¾ back.
		Juglans (Walnut).
1510	6	J. nigra (black walnut) '08, 1 alive; '09, alive at root.
		Kolreuteria.
991	2	K. paniculata '08, 1 alive '09; dead.
		Lespedeza.
842	2	L. Sieboldi '08, 1 alive; '09, alive at base.

TREES AND SHRUBS (IRRIGATED)—*Continued.*

Reference Number.	No. set out.	Name.
		Ligustrum (Privet).
368	3	L. amurense '08, thrifty; '09, killed about half back.
		Lonicera (Honeysuckle).
848	4	L. Alberti '09, thrifty, in bloom.
960	7	L. Alpina '08, 6 alive; '09, alive at base but vigorous.
949	6	L. Fenzlei '09, killed nearly to base.
860	40	L. grandiflora '09, thrifty though some tips have killed back.
364	4	L. grata '07, 3 alive; '08, thrifty; '09, growing from base.
980	6	L. Morrowi '09, vigorous but about $\frac{1}{4}$ killed back.
955	5	L. Voronesh No. 133, '08, 3 alive; '09, alive at base but thrifty.
391	3	L. from Manitoba '08, thrifty; '09, thrifty.
1077	6	L. tatarica virginalis alba '08 alive; '09, thrifty, killed back but little, bloomed.
		Philadelphus.
525	6	P. coronarius foliis aureis, '08, 4 alive; '09, 3 alive, killed to base.
1563	4	P. grandiflorus, '08, killed back; '09, alive at base.
1006	6	P. hybridus Lemoinei Manteau d'Hermine, '08, 5 alive; '09, alive at base.
1039	6	P. hybridus Lemoinei Fantasia, '08, alive; '09, alive at base.
1500	4	P. hybrida Lemoinei Mont Blanc, '09, alive at base.
		Populus (Poplar).
1025	2	P. angustifolia, '09, vigorous.
		Prunus (Plum).
1002	4	P. alleghaniensis, '09, killed back about half.
		Ptelea (Wafer Ash).
976	4	P. trifoliata, '08, 3 alive but killed back; '09, alive at base.
		Pyrus.
	6	P. floribunda, fall, '07, 1 dead; '08, 3 alive.
1145	1	P. Ioensis, '09, killed half or more back.
1226	2	P. intermedia, '09, thrifty, one killed back a little.
485	5	P. Mougeoti, '07, 3 alive; '09, killed $\frac{2}{3}$ back.
852	6	P. Malus Sargenti, '08, 3 alive; '09, alive at base.
		Quercus (Oak).
832	30	Q. alba (white oak), '07, 20 alive; '08, 8 alive but killed back; '09, very small, killed about half back.
572	4	Q. palustris, '08, 2 alive killed back; '09, alive at base only.
401	6	Q. rubra, '08, alive but all killed back; '09, all killed back but not quite to ground.
		Rhamnus (Buckthorn).
566	6	R. davurica, '09, not particularly thrifty.
1087	6	R. Frangula, '09, killed nearly to base.
		Rhodotypos.
531	6	R. kerrioides, '08, all alive; '09, 5 alive, killed to base.
		Rhus (Sumach).
445	2	R. Cotinus, '07, one dead; '08, one alive; '09, dead.
		Robinia (Locust tree).
811	30	R. Pseudacacia (black locust), '07, did not establish themselves well, 10 alive in fall; '08, all dead.

TREES AND SHRUBS (IRRIGATED)—*Continued.*

Reference Number.	No. set Out.	Name.
		Rosa (Rose).
1241	2	R. cinnamomea, '09, alive.
457	2	R. ferox, '08, 1 alive ; '09, alive at base.
440	2	R. humilis, '08, killed back some ; '09, partly dead
990	1	R. lucida alba, '09, killed to base.
459	2	R. lutea, '08, 2 alive ; '09, partly killed back.
878	9	R. rugosa, '09, fairly thrifty.
399	2	R. spinosissima hispida, '08, thrifty ; '09, thrifty.
369	2	R. tomentosa, '08, thrifty ; '09, thrifty.
389	2	R. Virginiana, '08, thrifty ; '09, thrifty.
		Roses.
349	1	R. alba rubrifolia, '08, thrifty.
344	1	R. Crimson Rambler, (Philadelphia), '08, thrifty ; '09, fairly hardy.
352	1	R. Dorothy Perkins, '08, almost dead ; '09, killed back to roots.
351	1	R. Evergreen Gem, '08, thrifty ; '09, fairly thrifty.
354	1	R. Frau Karl Druschke, '08, thrifty, good blooms (white) ; '09, dead.
345	1	R. Helen Gould, '08, in bloom, very fine ; '09, thrifty.
359	1	R. Lady Gay, '08, thrifty ; '09, dead.
346	1	R. May Queen, '08, dead.
358	1	R. Marshall P. Wilder, thrifty, very choice ; '09, small but thrifty.
353	1	R. Madame Gabriel Luizet, '08, dead.
357	1	R. New Century, '08, thrifty ; '09, half-hardy.
356	1	R. Paeonia, red, half double, '08, thrifty ; '09, thrifty.
350	1	R. Pearl Queen, '08, thrifty ; '09, killed back badly.
351½	1	R. Ruby Queen, '08, thrifty.
348½	1	R. Sir Thos. Lipton, '08, thrifty, in bloom (white); '09, thrifty.
347	1	R. Universal Favourite, '08, thrifty ; '09, thrifty.
348	1	R. Wm. C. Egan, '08, thrifty ; '09, looks vigorous.
		Rubus.
496	4	R. fasciculatus chinensis, '09, killed to base.
		Salix (Willow).
804	6	S. rosmarinifolia, '08, killed back ; '09, killed to base.
934	5	S. Voronesh, '08, thrifty; '09, tips killed back.
		Sambucus (Elder).
926	1	S. nigra aurea nova, '09, killed to base.
		Spiraea (Meadow Sweet).
939	4	S. arguta, '08, 3 alive ; '09, about half killed back.
363	6	S. callosa superba, '08, thrifty, in bloom.
1083	4	S. sorbifolia, '09, alive at base.
887	6	S. Van Houttei, '09, killed back about ¾, bloomed.
		Syringa (Lilac).
443	2	S. amurensis, '08 and '09, thrifty.
451	6	S. pekinensis, '08, 5 alive ; '09, 4 alive and all killed about ¾ back.
...	76	S. villosa, '09, all alive and perfectly hardy.
541	2	S. vulgaris Boussingault, '09, thrifty.
462	6	S. " Charles X, '09, all thrifty but one killed at tips.
540	3	S. " Condorcet, '09, thrifty.
564	6	S. " Congo, '09, thrifty.
...	16	S. " ....?, '09, all alive and thrifty.
550	2	S. " Abel Carriere, '09, fairly thrifty.
553	1	S. " Dr. Troyanowsky, '09, partly thrifty.
515	4	S. " Emile Lemoine, '09, thrifty though killed back a little.
546	2	S. " Flora plena Linn., '09, fairly thrifty.
562	1	S. " Francisque Morel, '09, partly thrifty.
5[illegible]1	6	S. " Jacques Calot, '09, thrifty.
542	4	S. " La Tour d'Auvergne, '09, thrifty.

TREES AND SHRUBS (IRRIGATED)—*Continued.*

Reference Number.	No. set Out.	Name.
		Syringa (Lilac)—Concluded.
554	2	S. " Leon Simon, '08, 1 alive, '09, only partly thrifty.
551	2	S. " Louis Henry, '09, partly thrifty.
565	2	S. " Ludwig Späth, '09, thrifty.
544	2	S. " Madame Abel Chatenay, '09, thrifty.
549	2	S. " " Briot, '07, not very thrifty.
555	6	S. " " Casimir Perier, '08, 5 alive ; '09, 4 of the 5 thrifty.
547	2	S. " " Lemoine, '09, fairly thrifty.
538	7	S. " Mademoiselle Fernande Viger, '09, thrifty.
552	2	S. " Président Grévy, '08, 1 alive ; '09, partly thrifty.
548	2	S. " Prince de Beauveau, '09, fairly thrifty.
537	1	S. " Madame de Miller, '08, thrifty ; '09, partly killed back.
543	1	S. " rothamagensis metensis, '09, killed back slightly.
479	6	S. " Souvenir de Ludwig Späth, '08, 2 alive ; '09, hardy but small grower.
539	2	S. " rubella plena, '09, thrifty.
		Tilia (Linden, Basswood).
576	2	T. Europæa, '08, badly killed back ; 09, 1 alive killed back half.
		Ulmus (Elm).
829	400	U. americana, '07, established themselves well ; '08, 95 per cent killed half way back; '09, killed back same as last year, some clear to base. (Note). These trees were grown from seed collected in northern part of U. S., not from Manitoba.
		Viburnum (Arrowwood)
500	3	V. dentatum, '09, killed to base.
1262	6	V. molle, '09, all more or less killed back.
1255	1	V. sargenti, '09, ⅓ killed back.
986	2	V. venosum, '09, alive at base.
		List of Coniferae. Abies (Fir).
...	20	A. balsamea, '07, nearly all dead ; '08, dead.
416	2	A. concolor, '07, 1 alive ; '09, living.
		Juniperus (Juniper).
421	4	J. Sabina, '08, 1 alive ; '09, barely alive.
		Larix (Larch-Tamarac).
1288	25	L. leptolepis, '07, all dead but one ; '08, alive; '09, dead.
		Picea (Spruce).
415	2	P. Engelmanni, '08, 1 alive ; '09, dead.
513	2	P. excelsa pygmaea, '08, 1 alive ; '09, partly alive.
414	6	P. pungens, '08, thrifty ; '09, thrifty.
		Pinus (Pine).
419	12	P. sylvestris (Scotch pine), '07, 8 alive ; '09, six of the 8 are thrifty.
		Pseudotsuga.
782	50	P. Douglasii, '07, 8 lived ; '09, small but thrifty.
		Thuya. (Arbor Vitae).
1165	6	T. occidentalis globosa, '07, 4 dead ; '08, 2 alive ; '09, alive at base.
417	6	T. occidentalis Hoveyi, '08, alive but killed back ; '09, about dead, only 3 showing signs of life.

LAYING OUT A VEGETABLE GARDEN.

In a new country like this, where grain-raising is so universally followed, the vegetable garden is apt to be neglected. The excuse offered is that there are so many other things to do that one has not time to bother with it, but, by a little care in laying out the ground, much of the hand-work, which is the bugbear, may be avoided. The different kinds of vegetables should be planted in rows far enough apart to allow a horse cultivator to be worked between them. The amount of land used is generally of little moment to the farmer for at most it is a small area, so the rows for lettuce, onions, &c., may be put 2 feet apart. The larger-growing plants, such as peas and potatoes, &c., may be put 3½ or even 4 feet apart. On land that cannot be irrigated there is an added advantage in this, for it gives more space for the roots to forage for moisture. The rows should be made somewhat long so that there need not be too much time lost in turning. It is not necessary that a full length row of any one kind be planted. For example, if the garden is 600 feet long, any desired part of this length of row may be sown with lettuce, then on the same row as many feet of radish as required and so on down the list of vegetables that one wishes to put 2 feet apart. By planting the garden in this way, it is possible, if a horse cultivator is used occasionally, to raise a lot of vegetables with very little hoeing and other hand work. Always give level cultivation and hill or bank the plants as little as possible to avoid drying the land out.

IRRIGATING VEGETABLES.

What has just been said about planting the garden in long rows is particularly important where irrigation is to be practised. The rows should always run up and down the fall of the ground so that the water will readily run down between the rows. When it is desired to give an irrigation, make a small trench between the rows, without throwing earth against the plants if possible, and then allow only a small stream of water to trickle down. Let it run until the ground is thoroughly saturated between the trenches, but do not allow the land to be flooded where the plants stand, for this causes the soil to bake and crust close around the plants, injuring them unnecessarily and quite often requiring an extra hoeing. Thorough irrigations are recommended rather than more frequent light ones. As soon as the land dries off sufficiently after each irrigation, a light cultivation should be given.

THE VEGETABLE GARDEN.

Complete notes on the various things grown in the garden will not be attempted, but some of the results that it is deemed may be of interest are given.

ASPARAGUS AND RHUBARB.

Every garden should contain an asparagus bed and some rhubarb, for it is the first early green stuff in the spring that is perhaps the most appreciated. An asparagus bed was set out in the spring of 1908 and a little was obtained for the table this year, although it usually requires from two to three years before a bed comes into full productiveness. The first cutting was made June 4.

The first rhubarb used from the roots set out in 1908 was from the Excelsior on May 28. On the non-irrigated patch, the first used was on June 4 from the Magnum Bonum and the Brabant's Colossal.

BEANS.

Of the five kinds of beans grown, the Wardwell's Kidney Wax was the best of the wax varieties. The Dwarf Extra Early Edible Pod was quite early. The Haricot

Flageolet, Short Season Green Pod Bush, and the Dwarf Wax Early gave fair results. All the varieties ripened most of their seed.

BEETS.

Crosby's Egyptian and Long Dark Smooth Blood Red were grown. The former was a little more desirable for early use.

CABBAGE AND CAULIFLOWER.

Four varieties of cabbage were grown, Early Jersey Wakefield, Prize Hard Head, World Beater and Premium Flat Dutch. The Jersey Wakefield was the earliest and gave very satisfactory results. The World Beater and the Flat Dutch do well for a main crop.

Three varieties of cauliflower were grown, Lenormand's, World's Best and Danish Drouth-Resisting. They were all early.

CARROTS.

The early Gem and the Half-Long Scarlet Luc were grown the latter is an excellent variety for summer use.

CELERY.

Three varieties were grown, New Rose, Paris Golden Yellow and Short Season Self-Blanching. The New Rose appeared to give the most satisfactory results as it yielded somewhat better and was good for winter use.

TABLE CORN.

Six varieties were grown, the Early Market, Early Premo, Squaw, Sugar, Seymour Orange Sweet and Golden Bantam. The Squaw was much the earliest, but the Golden Bantam was better in quality and flavour than any of the others. The Early Market, Sugar and Seymour Orange Sweet were too late; as they were frosted just about the time the first ears were ready for use.

PEAS.

Practically all of the standard varieties of peas did well. Four varieties were planted April 22, Alaska, Rennie's Best Extra Early, Dwarf Telephone and Tall Telephone. The Alaska was the earliest, the first being used on July 8. The Dwarf Telephone was the best in quality and flavour and it had a fairly long season.

OTHER VEGETABLES.

Lettuce, radish, parsley, spinach, parsnips, &c., all did well. Of the three varieties of onions grown, Extra Early Red, Australian Brown and Golden Yellow, the last one outyielded the others. In planting onions, it is important to use only the earliest sorts. For early green onions, sets should be used. Two varieties of cucumbers were planted in the garden May 28, the Cool and Crisp and Perfection; both varieties did well. The first used from each variety was on August 7 and 12 respectively. Hubbard Squash grown from home-selected seed ripened last year, did fairly well; about half of the crop ripened. Early Yellow Bush Scallop Squash did not do quite as well as usual as only about half of the crop matured. Pumpkins were somewhat late, only a few ripening. A few muskmelons ripened after the frost killed the vines. The variety used was Earliest of All. Only one variety of tomatoes was grown, Sparks' Earliana from selected seed supplied from the Central Experimental Farm. Owing to a mishap to the plants while in the cold frame, they were small and weak

when put out in the garden, which was not done till July 2. However, quite a few tomatoes set on the vines and a number ripened.

FLOWERS.

In the flower garden, the annuals will always have a place, but perennials should be given particular attention for they come on year after year, producing strong, vigorous blooms earlier than the average annuals do. There are a number of hardy perennials that might be mentioned, but probably there is none more satisfactory than the pæony, for, after it is once established, it is extremely hardy, withstanding, if necessary, much neglect and still making a beautiful display of blooms.

ANNUALS.

The following annuals were planted in the open during the latter part of May and most of them made a nice showing during the summer and fall: Pansy, Dianthus, Asters, Abronia Umbellata, Antirrhinum Majus, Poppy, Godetia, Candytuft, Corcopsis, Nicotiana, Ageratum, Brachycome, Lobelia, Mignonette, Petunia, Phlox Drummondi, Bartonia, Gaillardia, Scabiosa, Balsam.

BULBS.

The following bulbs were set out in the fall of 1908:—

Crocuses.—Blue, Yellow, Purple, Striped variegated, White.

Tulips.—Artus (brilliant scarlet), Cottage Maid (rose pink and white), Chrysolora (pure yellow), Double superfine (mixed colours), Duc van Tholl (crimson), Duc van Tholl (gold laced), Gesneriana spathulata (scarlet and blue), Gloria solis (red, with gold), Joost von Vondel (cherry-red, white feathered), Kaiser's Kroon (scarlet and yellow), L'Immaculate (white), Parrot (mixed), Pottebakker (yellow), Pottebakker (white), Pottebakker (scarlet), Prosperine (carmine rose).

Other bulbs.—Bulbocodium vernum, Chionodoxa gigantea (Glory of the Snow), Colchicum autumnale (Meadow Saffron), Frittillaria Imperialis, Galanthus nivalis (Snowdrops), Giant Snow Drops, Iris Hispanica, Leucojum aestivum, Frittillaria vernum (Snowflake), Scilla Sibirica (Squills).

The exceptional winter conditions were apparently unfavourable for bulbs. The crocuses and tulips all lived through, but the blooms were not so large as they were last year. Most of the other bulbs failed to grow in the spring.

MEASUREMENT OF WATER USED IN IRRIGATING.

On account of the railroad passing through the Farm, it is necessary to take the water from the Irrigation Company's main ditch at two points, consequently two measuring devices are required. Two 2-foot Cippoletti weirs have been installed. A Lalli water register is used at one and a Freiz water register at the other. A complete record of the water used north of the track was obtained from the Freiz register, but the record at the weir on the south side of the track was not satisfactory. North of the track there was 21·9 acres under crop this season. It was all sown in grain. One flood irrigation was given, which began at noon on July 10 and was completed on the forenoon of the 17th. This was the first irrigation the land had ever received. The prairie had been broken the previous June and spring wheat, oats, barley, and a small area of peas were sown this spring. The surface was irregular on account of some old laterals that had been ploughed in. During one or two nights, considerable waste water ran off the field and there was no means at hand to determine this amount, but possibly it was not more than is often wasted by the average irrigator in the district.

To the 21·9 acres, in the one irrigation 40·1137 acre feet of water were applied. For the benefit of any who are not familiar with the term, it might be explained that an 'acre-foot' is a unit of measure in common use in irrigation districts and expresses the quantity of water necessary to cover an acre a foot deep. Considering the character of the soil, which is a clay to a sandy loam underlaid with a clay subsoil, this is a large amount of water for a single irrigation for it was sufficient to cover the whole area a little over 1·83 feet deep. The average volume of the stream used was approximately 3 second feet, which means that there were 3 cubic feet of water passing a given point on the ditch every second, or in other words that there were 3 cubic feet of water per second flowing on to the field during the time that the irrigation was in progress.

The record of the water used on the south side of the track is not quite complete this season. Quite small fields were irrigated, so these data will not be given here but will be kept on file and may be used in the future.

HORSES.

Eight work horses and two drivers are kept on the Farm. In addition to these. there are one three-year-old colt and a two-year-old filly.

CATTLE.

Two grade cows are kept to supply milk to the families on the Farm. A two-year-old heifer, the calf of one of these cows, has been raised, but will be disposed of. as it has not developed into a very desirable animal.

FARMERS' EXCURSION TO THE FARM.

The Provincial Department of Agriculture arranged for an excursion to the Farm on July 23. A special Canadian Pacific railway train was run from Calgary, and special rates were obtained over the A.R. & I Co.'s lines. This was the first excursion of this kind to the Farm and there were quite a large number of farmers who availed themselves of the opportunity.

MEETINGS AND CONVENTIONS ATTENDED.

Being secretary of the Western Irrigation Association for the current year, I had considerable work in connection with the third annual meeting which was held at Spokane, August 9 to 13, at which I spent a most profitable week. I attended the Dry-Farming Congress at Billings, Montana, October 25 to 29, and delivered an address.

During the year I have attended a number of seed fairs, acting as judge and speaking on various subjects at the conclusion of the judging. I also acted as one of the judges at the Provincial Seed Fair.

DISTRIBUTION OF SAMPLES.

A distribution of samples of grain, potatoes and small packets of seedling trees was made from the Farm and the following material was sent out up to March 31, 1910:—

5-lb. bags of winter wheat	167
5-lb. bags of spring wheat	299
5-lb. bags of barley	95
4-lb. bags of oats	170
3-lb. bags of potatoes	568
Total number of samples distributed	1,299

SALE OF GRAIN.

In disposing of the surplus wheat, a rule has been made limiting each applicant to not more than four bushels. This, if sown on well-prepared summer fallow or June breaking, will produce from 100 to 200 bushels of seed for the second season. Up to March 31, 228 of these 4-bushel lots of wheat have been sold.

CORRESPONDENCE.

For the twelve months ending March 31, 1910, there were 3,748 letters received and 3,517 letters sent out, not including circulars and reports.

METEOROLOGICAL REPORT.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.
1909.	Date.	Degrees.	Date.	Degrees.	Inches.	Hours
April	24	68·2	30	3·0	1·148	231·4
May	3	76·9	6	24·8	4·01	231·6
June	15	84·6	25	34·5	0·82	302·4
July	23	90·8	7	39·8	1·54	345·7
August	14	91·0	29	29·6	0·08	378·7
September	25	87·9	14	26·8	0·47	241·4
October	3	75·5	30	10·4	0·37	185·6
November	3	61·4	15	−17·4	0·46	88·5
December	29	49·4	7	−28·4	0·42	101·8
1910.						
January	23	55·1	2	−12·4	0·24	170·0
February	5	43·0	22	−35·5	0·83	116·0
March	20	74·0	1	3·4	0·17	151·8
Totals					10·558	2544·9

In the above, 10 inches of snow is computed as 1 inch of precipitation.

The hours of bright sunshine for the months of February and March, 1910, are not correct, being less than actually occurred, owing to the fact that the instrument from about February 20 to March 14 was out of order and did not make a complete record of all the hours the sun was shining.

ACKNOWLEDGMENT.

It is certainly a pleasure to take this opportunity of acknowledging the faithful services of each member of the Farm staff and of expressing my appreciation of the intelligent interest they have taken in the past year's work. I am especially grateful to W. C. Poland, the Foreman, for the careful notes he has kept and for his aid and general co-operation.

I have the honour to be,

Your obedient servant,

W. H. FAIRFIELD,

Superintendent.

EXPERIMENTAL FARM FOR CENTRAL ALBERTA

REPORT OF G. H. HUTTON, B.S.A., SUPERINTENDENT.

LACOMBE, ALTA., March 31, 1910.

Dr. WM. SAUNDERS, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you my third annual report covering the operations of the Experimental Farm for Central Alberta, at Lacombe, for the year ending March 31, 1910.

The spring of 1909 was later than that of 1908, and, after the snow melted, there was considerable thawing and freezing. These warm days and cool nights proved very trying on winter wheat, which, in all parts of the province, was rather badly spring-killed.

The first seed was sown on this Farm on April 19 but, because of the hard night frosts, seeding did not progress as rapidly as usual and field crops of wheat were not sown till May 1, which was, this year, too late to give time to mature.

Weather conditions were very favourable after night-freezing ceased and all grain crops grew rapidly, making up, to some extent, for the rather late seeding. Moisture was not lacking, while the season developed warmer nights than usual and all test plots and field crops gave promise of a bountiful harvest.

The first hail storm on record for this locality passed through the district on August 1, covering a stretch of country about 2½ miles wide by 20 miles in length. Since many of the earlier varieties of grain were nearing maturity on that date, it is impossible to draw positive conclusions from the results of the experiments with cereals reported herewith. The figures show clearly that the later varieties and those varieties having stiff straw suffered less from this storm than did the earlier varieties and those having finer or weaker straw.

The yields secured are far from a crop failure and are an indication of the splendid harvest enjoyed by the country generally.

EXPERIMENTS WITH WINTER WHEAT.

The spring of 1909 was very trying on winter wheat. From results on this Farm and elsewhere, it is evident that wheat came through much better on breaking or on sod than on summer-fallow. It is certain that the soil is firmer on breaking and on sod than on summer-fallow, and consequently the rise of moisture on the former is more rapid. The results given herewith indicate the effect of the continual thawing and freezing of the early spring. They also indicate the relative hardiness of Dawson's Golden Chaff and Turkey Red. These results were secured on land from which a hay crop was taken in 1908; the land was then ploughed, disced, packed, and prepared for winter wheat. The short period of cultivation given after ploughing was insufficient to subdue the timothy completely and much of it came on in the spring

with the winter wheat that survived. The stand of wheat being thin made conditions more favourable for the production of timothy seed. The average yield of timothy seed, which was separated by the machine at threshing, is also given.

The test plots of different varieties, all of which were sown on summer-fallow, were completely spring-killed and therefore no figures are available for these tests.

WINTER WHEAT—Quantities of Seed per Acre.

Variety.	Quantity of Seed.	Date Sown.	Date Cut.	Yield per Acre.		Average Yield of timothy seed per Acre.	
		1908.	1909.	Bush.	Lbs.	Bush.	Lbs.
Turkey Red	½ bushel	Aug. 15	Aug. 20	8	3¾	5	38½
"	¾ "	" 15	" 20	11	22½		
"	1 "	" 17	" 20	10	00		
"	1¼ "	" 17	" 20	5	52½		
"	1½ "	" 17	" 20	11	26¼		
"	1¾ "	" 17	" 20	10	37½		
"	2 "	" 17	" 20	12	33¾		

In the above test, Dawson's Golden Chaff was sown side by side with Turkey Red at the same rates of seed per acre but was so nearly killed out that it was ploughed under.

WINTER WHEAT—Dates of Sowing.

On the first day of August, a sowing was made of Dawson's Golden Chaff and Turkey Red, at the rate of 75 pounds of seed per acre, on fall-ploughed timothy sod. Sowings of each variety at weekly intervals were made up to September 12, but none of the plots sown on or after August 15 were considered worth leaving. While early-sown wheat suffered badly by spring killing, seedings made up to about the middle of August proved hardier this year than seedings made after that date.

WINTER WHEAT—Dates of Sowing.

Variety.	Date of Sowing.	Date Cut.	Yield per Acre.		Average Yield of timothy seed per Acre.	
	1908.	1909.	Bush.	Lbs.	Bush.	Lbs.
Turkey Red	Aug. 1	Aug. 20	4	45	9	1
"	" 8	" 20	9	11¼		
Dawson's Golden Chaff	" 1	" 20	1	11¼	9	4½
" "	" 8	" 20	5	26½		

EXPERIMENTS WITH SPRING WHEAT.

Twelve varieties of spring wheat were sown on April 19 on timothy sod ploughed in 1908 after the hay crop was harvested. All varieties made splendid growth with no indication of rust, but their relative standing has been influenced, without doubt, by the hail storm of August 1. This storm also affected the length of time required to ripen, as development was checked and afterward most varieties came on together. Seed was used at the rate of about one and three-quarter bushels per acre. All plots were one-sixtieth of an acre each and the soil was black clay loam.

SPRING WHEAT—Test of Varieties.

Number.	Variety.	Date of Ripening.	No. Days Maturing.	Length of Straw including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
				Inches.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Hungarian White....	Sept. 6.	140	54	Stiff.	3¾	Bearded....	6,480	42	52½	62½
2	Bishop..............	" 11.	145	52	"	3½	Beardless...	7,065	42	13	60
3	Chelsea	" 4.	138	51	"	4¼	"	5,565	33	13	58
4	Pringle's Champlain....	" 6.	140	53	"	3½	Bearded.. ..	6,105	32	18¾	62
5	Marquis	" 4.	138	49	"	3¾	Beardless...	5,505	30	13	60½
6	Huron....	Aug. 28.	131	48	"	3¼	Bearded....	4,980	28	00	60
7	Percy.....	Sept. 4.	138	51	"	3½	Beardless ..	4,485	23	22¼	57½
8	White Fife	" 11.	145	50	"	3½	"	4,740	21	3¾	57
9	Preston..............	Aug. 28.	131	51	"	3½	Bearded....	4,980	20	00	57½
10	Stanley............ ...	" 28	131	52	"	4¼	Beardless..	5,115	17	39¼	57
11	Red Fife II...........	Sept. 6.	140	50	"	3	"	5,295	14	52½	52
12	Riga.................	Aug. 21.	123	44	"	2½	"	4,235	12	33¾	59

SPRING WHEAT—Dates of Sowing.

Four sowings of Chelsea Beardless spring wheat were made at intervals of one week. All seedings were made on similar soil and seed at the rate of 1¾ bushels per acre was used in each case. No rust was observed.

Variety.	Date Sown.	Date of Ripening.	Length of Straw including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		Inches.	Lbs.	Bush.	Lbs.
Chelsea.......... ..	April 19..	Sept. 4....	51	Stiff.......	4¼	5,565	33	13
"	" 26..	" 11. ..	53	"	4	6,105	31	15
"	May 3..	" 11....	52	"	4	5,775	31	41¼
"	" 10..	" 11....	53	"	4¼	6,900	39	00

SPRING WHEAT—Quantities of Seed per acre.

Five sowings of Chelsea were made on April 26 at different rates of seed per acre with the following result. All were harvested September 11. No rust was observed.

Variety.	Bushels Seed per Acre.	No. days Maturing.	Length of Straw Including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		Inches.	Lbs.	Bush.	Lbs.
Chelsea.............	¾	142	57	Stiff.....	4¼	6,375	28	39¼
"	1¼	140	55	"	4	6,225	29	11¼
"	1¾	138	55	"	3¾	5,970	29	26¼
"	2¼	138	54	"	3¼	6,675	36	50½
"	2¾	136	52	"	3¼	6,255	33	46¾

EXPERIMENTS WITH EMMER AND SPELT.

Plots of one-sixtieth of an acre each of Common Emmer and Red Spelt were sown on May 6. The soil and its cultivation was similar to that for the other test plots. The seed was sown at the rate of 120 pounds per acre.

Variety.	Date Ripened.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	Weight of Straw.
			Inches.		Inch.		Lbs.	Lbs.
Common Emmer..................	Sept. 11	128	46	Stiff.	2½	Bearded.	1,140	4,330
Red Spelt....................	" 11	128	50	"	4	Beardless.	1,560	5,100

EXPERIMENTS WITH RYE.

One plot of bearded fall rye was sown on August 27, 1908, and a plot of bearded spring rye on May 6, 1909. The soil was a black clay loam and was cultivated in a similar manner as for the fall and spring wheats. Seed was used at the rate of one and one-half bushels per acre.

Variety.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.		Inch.	Lbs.	Bush.	Lbs.	
Fall Rye....................	Aug. 18	356	56	Stiff.	5	4,714	24	46	58
Spring Rye..................	Sept. 1	118	58	"	4	4,290	13	30	51½

SPRING WHEAT—TEST OF COMMERCIAL FERTILIZERS.

Nitrate of Soda, Muriate of Potash, Superphosphate of Lime and Basic Slag were applied to one-sixtieth-acre plots of spring wheat (the Chelsea variety being used) in the quantities and proportions indicated below. The storm of August 1 was most severe along the north boundary of the Farm and the yield of these plots, which were located nearer the northern line than any other so far reported on, is correspondingly low.

Variety.	Lbs. per Acre.	Fertilizer.	Date of Ripening.	No. of days Maturing.	Weight of Straw.	Yield per Acre.	
					Lbs.	Bush.	Lbs.
Chelsea	500	Basic Slag....................	Aug. 21	110	3,596	13	3¾
" ...	200	Nitrate of Soda................	" 21	110	4,247	15	13
"	300 100	Superphosphate of Lime. Muriate of Potash.......	" 21	110	3,247	8	52½
"	500 100	Basic Slag.......... Muriate of Potash...	" 21	110	2,741	8	18¾
"	300	Superphosphate of Lime...........	" 21	110	3,656	12	3¾
"	100	Muriate of Potash................	" 21	110	2,831	12	48¾
"	300 100 200	Superphosphate of Lime. Muriate of Potash...... Nitrate of Soda.........	" 21	110	3,435	7	45
"		Check Plot....................	" 21	110	2,295	5	45

SPRING WHEAT SOWN IN FALL.

A plot of one-sixtieth of an acre of Stanley spring wheat was sown on November 4, 1908. This grain germinated in the spring and made good growth. It was cut on August 28 and yielded 12 bushels and 30 pounds per acre.

EXPERIMENTS WITH OATS.

All experiments with oats were conducted on land ploughed out of timothy sod in 1903 after the hay crop was harvested. The land was packed the same day and disced up at once. There was no lack of moisture in the spring of 1909. The seed was sown on May 5 at the rate of about one and one-half bushels per acre, with the exception of one plot of Garton's 'Regenerated' Abundance, which was sown at the rate of 5½ bushels per acre. Thirty varieties were tested on plots of one-sixtieth of an acre each. The soil was a black clay loam.

OATS—Test of Varieties.

Number.	Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Golden Beauty	Aug.	24	111	51	Stiff.. ..	8½	Branching	6,375	59	19	36
2	Garton's 'Regenerated' Banner..................	"	24	111	52	"	9	"	6,720	58	8	39½
3	Danish Island..............	"	25	112	50	"	9¼	"	6,990	57	12	37½
4	Pioneer.....	"	21	108	47	"	8½	"	5,760	56	16	43
5	Improved American.......	"	27	114	51	"	10½	"	6,480	56	16	37½
6	Siberian..................	"	26	113	54	"	8	"	6,360	54	14	36½
7	Milford White.............	"	25	112	54	"	9	Sided	6,000	51	6	37½
8	Irish Victor.	"	27	114	50	"	8	Branching	6,360	51	6	39½
9	Garton's Victor............	"	21	108	49	"	11¾	"	5,340	49	14	38½
10	Kendal White	"	27	114	52	"	10	"	5,700	47	22	37
11	Garton's 'Regenerated' Abundance..............	"	24	111	57	"	9	"	6,720	47	22	37
12	Wide Awake...............	"	24	111	50	" ...	9	"	6,300	47	22	36
13	Tartar King............ ...	"	26	113	53	"	9¼	Sided	5,415	47	7	30
14	Abundance	"	28	115	56	"	9½	Branching	6,450	46	26	36½
15	Storm King...............	"	24	111	59	"	11	Sided . ..	6,345	46	11	30
16	American Triumph....	"	24	111	53	"	9¼	Branching	6,360	45	30	38½
17	Banner.....	"	24	111	51	"	8¾	"	6,525	44	19	37½
18	Montgomery..............	"	26	113	50	"	10¼	"	5,505	42	27	35½
19	Swedish Select............	"	26	113	50	"	7¼	"	5,340	42	12	33
20	Poland....................	"	21	108	56	"	11	"	5,280	42	12	37½
21	White Giant...............	"	24	111	45	"	10	"	5,235	41	31	38
22	Twentieth Century....... ..	"	26	113	49	" . ..	8½	"	5,085	41	1	37
23	Thousand Dollar..	"	24	111	48	"	8	"	6,060	40	20	34
24	Garton's 'Regenerated' Abundance (5½ bush. seed)	"	21	108	43	"	7	"	5,400	40	20	37
25	Dawson	"	21	108	55	"	10	"	5,550	39	24	42
26	Improved Ligowo.........	"	26	113	50	"	7½	"	6,060	38	28	36
27	Alsasman	"	24	111	52	"	8¾	"	5,820	37	2	34
28	Lincoln.....	"	24	111	54	"	8½	"	5,790	35	40	35
29	Virginia White.....	"	24	111	46	"	8	"	5,130	34	14	35
30	Orloff	"	18	105	40	Medium	7	"	3,840	28	8	31

OATS—FALL SOWN.

On November 9, 1908, a plot of Tartar King oats was sown on well-prepared summer-ploughed timothy sod. As winter weather set in the night of the 9th of November, the seed did not germinate in the fall. In the spring, the oats came on early, grew well and were fairly well matured when partially threshed by the hail storm on August 1. Further work will be necessary in this direction before conclusions can be drawn. At present the fall sowing of oats is not advised.

FALL SOWN OATS.

Date Sown.	Date Cut.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
		Inches.		Inches.		Lbs.	Bush.	Lbs.
Nov. 4, '08.....	Aug. 21....	52	Stiff.. ...	9½	Sided.	5,760	17	22

OATS—QUANTITIES OF SEED PER ACRE.

At the rate of one bushel per acre and increasing at the rate of one-half bushel per acre in each plot up to four and one-half bushels per acre, Banner and Thousand Dollar oats were sown side by side on the same day. The figures this year would indicate that from 2 to 2½ bushels of seed per acre may be expected to give the best results. In previous tests, from 3 to 3½ bushels per acre have given the largest yields. The quantity of seed per acre has an influence on early maturity. Grains nearing maturity on the 1st of August suffered more from the hail than greener plots.

OATS—Quantities of Seed per Acre.

Variety.	Bush. seed per Acre.	No. of days maturing.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
				Inches.	Lbs.	Bush.	Lbs.
Banner..............	1	114	Stiff..	9¾	4,620	33	18
"	1½	114	"	10	5,775	43	23
"	2	113	" . . .	9	5,280	56	16
"	2½	112	"	9	5,700	50	25
"	3	110	"	9	6,045	51	21
"	3½	107	"	8¾	6,270	46	26
"	4	107	"	8½	5,400	45	30
"	4½	107	" ...	7½	5,520	42	12
Thousand Dollar................. ..	1	114	"	10	5,790	36	6
" "	1½	111	"	9	5,415	38	13
" "	2	110	"	8½	5,340	38	28
" "	2½	110	"	8	5,205	39	9
" "	3	107	"	7½	5,415	33	3
" "	3½	107	"	7¼	5,685	30	15
" "	4	107	"	7	4,500	26	16
" "	4½	107	"	7	4,530	23	23

OATS—DATES OF SOWING.

Two varieties of oats were sown under similar conditions on different dates, commencing May 3 and continuing at intervals of one week to May 31.

OATS—Date of Sowing.

Variety.	Date Sown.	Date Ripened.	No. of days Maturing.	Weight of Straw.	Yield per Acre.	
				Lbs.	Bush.	Lbs.
Banner	May 3	Aug. 24	113	6,435	43	23
"	" 10	" 27	109	5,700	44	4
"	" 17	Sept. 1	107	6,075	54	9
"	" 24	" 1	100	5,970	64	14
"	" 31	" 11	103	7,110	90	30
Thousand Dollar	" 3	Aug. 24	113	6,060	40	20
" "	" 10	" 27	109	4,950	36	6
" "	" 17	Sept. 3	109	5,985	44	19
" "	" 24	" 6	105	6,090	50	10
" "	" 31	" 11	103	6,420	74	4

APPLICATION OF BARNYARD MANURE TO OATS.

In 1908, applications of barnyard manure at 10 and 20 tons per acre were made to land on which oats were to be sown. Oats were again sown on this land in 1909, on May 4, and in addition fresh plots were manured this year. Following is the table:—

OATS—Manure.

Variety.	Manure.	Quantity of Seed.	Date Ripened.	No. of days Maturing.	Yield.	
	1908.	Bush.			Bush.	Lbs.
Banner	None	2½	Aug. 21	109	45	15
"	10 tons	2½	" 21	109	39	24
"	20 "	2½	" 21	109	45	0
	1909.					
"	10 tons	2½	" 21	109	49	14
"	20 "	2½	" 21	109	67	2

EXPERIMENTS WITH BARLEY.

The barley crop of 1909 gave splendid promise. All test plots were sown on fall-ploughed timothy sod, well worked both in the fall and spring. Under usual conditions, a heavy yield would have been secured. Seed was sown at the rate of about two bushels per acre of the ten six-rowed, and two and one-quarter bushels per acre of the eleven two-rowed varieties tested. The soil was a black clay loam; all plots were one-sixtieth of an acre in size and were sown on May 4.

SIX-ROWED BARLEY—Test of Varieties.

Number.	Variety.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Mensury....	Aug. 18	106	50	Stiff....	3¼	Bearded..	5,700	40	—	45
2	Claude..........	" 14	102	47	" ...	2¼	" ..	5,130	33	6	37½
3	Mansfield........	" 14	102	50	" ...	2¾	" ..	5,220	28	36	44
4	Odessa...	" 14	102	46	" ...	2½	" ..	5,340	27	24	45
5	Oderbruch.... ...	" 14	102	48	" ...	3	" ..	4,860	20	—	41½
6	Albert	" 14	102	50	" ...	3¼	" ..	5,610	19	18	40
7	Yale	" 14	102	52	" ...	2½	" ..	4,950	19	18	42
8	Nugent...... ...	" 14	102	48	" ...	3¼	" ..	3,690	18	6	41
9	Stella..........	" 14	102	46	" ...	3	" ..	4,590	18	6	43
10	Trooper......	" 14	102	43	" ...	2¾	" ..	3,690	16	42	41½

TWO-ROWED BARLEY—Test of Varieties.

Number.	Variety.	Date Ripened.	Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inch.		Inch.		Lbs.	Bush.	Lbs.	Bush.
1	Invincible.............	Aug. 18.	106	50	Stiff....	3	Bearded..	6,060	43	36	49½
2	Standwell..............	" 18.	106	49	Medium	3	" .	5,220	32	24	48
3	Canadian Thorpe	" 18.	106	48	Stiff....	3	" .	4,500	28	36	46½
4	Swedish Chevalier... .	" 18.	106	44	"	4	" .	5,250	28	6	51½
5	French Chevalier	" 18.	106	52	"	3¾	" .	5,595	23	21	49
6	Gordon	" 18.	106	57	"	2¾	" .	5,400	21	12	45
7	Beaver..........	" 18.	106	60	"	5	" .	5,655	19	33	43
8	Sidney	" 18.	106	45	"	3¼	" .	3,840	18	36	46
9	Clifford..	" 18.	106	60	"	4	" .	5,160	18	36	50
10	Danish Chevalier	" 18.	106	53	"	4¾	" .	4,995	18	21	48
11	Jarvis.................	" 18.	106	58		4	" .	5,595	15	45	47
12	*Hulless Barley	Sept. 28.	120	40	Weak ..	2½	Beardless.	4,815	52	17	54

* One plot of Hulless barley was sown on May 31, at the rate of two bushels per acre. The soil and cultivation was the same as that for the other barley tests.

EFFECTS OF A DIRECT APPLICATION OF MANURE TO BARLEY.

The following table gives the results of the test started in 1908, when 10 and 20 tons per acre of barnyard manure was applied to land to be sown to barley. In 1908, the direct application of manure to barley was not beneficial, but this year the results are in its favour. Increased yields are shown as a result of the application of 1908 as well as that of 1909.

MANURE AS APPLIED TO MENSURY BARLEY.

Variety.	Manure.	Quantity of Seed.	Date Sown.	Date Ripened.	Number of days Maturing.	Yield per Acre.	
						Bush.	Lbs.
Mensury	None 1908	2 Bush......	May 4......	Aug. 14	102	13	36
"	10 Tons. 1908...	2 "	" 4......	" 14	102	14	33
"	20 " " ...	2 "	" 4	" 14	102	23	6
"	10 " 1909...	2 "	" 4 ...	" 14	102	28	6
"	20 " " ...	2 "	" 4......	" 14	102	30	30

BARLEY—QUANTITIES OF SEED PER ACRE.

With Mensury barley representing the six-rowed varieties and Invincible the two-rowed varieties, an experiment was conducted with different quantities of seed per acre. Beginning with one bushel per acre and increasing at the rate of one-half bushel per acre for each plot; tests were made up to three bushels of seed per acre.

BARLEY—Quantities of Seed per Acre.

Variety.	Quantity of Seed.	Date Ripened.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
				Inches.		Inches.	Lbs.	Bush.	lbs.
Mensury..........	1 Bush....	Aug. 18....	106	55	Stiff....	3½	4770	29	18
"	1½ "	" 18....	106	53	" ..	3	4665	25	35
"	2 "	" 18....	106	52	" ...	2¾	4830	28	6
"	2½ "	" 18...	106	48	" ...	2¾	4080	21	12
"	3 "	" 18....	106	47	" ...	2½	4260	18	36
Invincible	1 "	" 18....	106	53	" ..	3½	5910	28	6
"	1½ "	" 18....	106	52	" ...	3¼	5340	30	..
"	2 "	" 18....	106	50	" ...	3	5760	22	..
"	2½ "	" 18....	106	44	" ...	2¾	4455	29	33
"	3 "	" 18....	106	45	" ...	2½	5130	40	30

BARLEY—SOWN AT DIFFERENT DATES.

Mensury and Invincible barleys were sown at intervals of one week under similar conditions of soil and cultivation. The amount of seed used was about 2 bushels per acre.

BARLEY—Sown at Different Dates.

Variety.	Date Sown.	Date Ripened	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
				Inches.		Inches.	Lbs.	Bush.	Lbs.
Mensury..........	May 3.	Aug. 18	107	50	Stiff....	3¼	5,700	40	..
"	" 10.	" 18	100	52	Medium	3½	5,865	25	35
"	" 17.	" 18	93	52	Stiff....	3¼	6,090	29	18
"	" 24.	Sept. 1	100	50	" ...	3¼	6,420	30	..
"	" 31.	" 1	93	49	" ...	3	6,195	37	9
Invincible	" 3.	Aug. 18	107	Hailstorm prevented measurements.	" ...	Hailstorm prevented measurements.	6,060	43	36
"	" 10.	" 18	100		" ...		4,935	34	33
"	" 17.	" 18	93		" ...		5,505	29	3
"	" 24.	Sept. 1	100		" ...		5,715	39	33
"	" 31.	" 5	97		" ...		6,375	34	33

TESTING THE SOIL-PACKER ON BARLEY.

In previous years, experiments with the surface soil-packer have been conducted with oats. This season, the work was done with barley. Unfortunately, these plots were on that portion of the Farm struck hardest by hail, hence the yields are low, but the result is still in favour of the use of the packer, which is strongly advised after ploughing either new or old land and again after the seed is sown. In this case, this system was followed. A determination of soil-moisture was made by Prof. Shutt which showed 38 per cent more moisture in the land which had been packed after ploughing in the fall than was contained in the land not so packed.

TESTING THE SOIL PACKER ON BARLEY.

Variety.	Soil.	Date of Ripening.	Days Maturing.	Weight of Straw.	Yield.	
				Lbs.	Bush.	Lbs.
Mensury......	Spring ploughing unpacked..	Aug. 14.....	88	2,730	14	18
"	Spring ploughing packed....	" 14.....	88	2,070	15	
"	Fall ploughing unpacked....	" 14.....	88	3,255	19	3
"	Fall ploughing packed.......	" 14.....	88	4,357	22	6

EXPERIMENTS WITH FIELD PEAS.

Sixteen varieties of field peas were sown on May 15. The soil was a black clay loam and was cultivated in a similar manner as for the other test plots. The plots were one-sixtieth of an acre each in size and the seed was sown at the rate of from two to three bushels per acre according to the size of the pea. With the exception of a second plot of the Wisconsin Blue, all plots were inoculated by means of soil from a field on which peas had made successful growth. Though all the yields are very poor, the results show an increase from inoculation.

FIELD PEAS—Test of Varieties.

Number.	Variety.	Date Ripened.	No. of Days Maturing.	Length of Straw.	Yield per Acre.	
				Inches.	Bush.	Lbs.
1	Chancellor............................	Sept. 4....	112	56	7	26¼
2	English Grey..........................	" 4....	112	58	6	20½
3	Early Britain	" 4....	112	57	6	5
4	Arthur	" 4....	112	60	5	26½
5	Daniel O'Rourke.......................	" 4....	112	51	4	33¾
6	Black-Eye Marrowfat...................	" 17....	125	65	4	20½
7	Mackay................................	" 17....	125	73	4	2¾
8	Prince................................	" 17....	125	57	3	45
9	Golden Vine...........................	" 4....	112	57	3	37½
10	Picton................................	" 17....	125	60	3	24¼
11	Victoria..............................	" 17....	125	56	2	26¼
12	White Marrowfat.......................	" 17....	125	58	2	20½
13	Wisconsin Blue........................	" 17....	125	54	2	13
14	Prussian Blue.........................	" 17....	125	57	2	7½
15	Gregory...............................	" 17....	125	70	1	22½
16	Paragon...............................	" 17....	125	65		41¼
17	Wisconsin Blue (not inoculated).......	" 17....	125	51	1	18¾

EXPERIMENTS WITH ALFALFA.

The spring of 1909 was a trying one on alfalfa. The relative hardiness of the Turkestan and the common alfalfa was made evident, also that inoculated alfalfa, being better developed, is in better condition to withstand such trying conditions than is uninoculated alfalfa. The inoculated part of the acre of common alfalfa, which

was sown in 1907 and which yielded 7,200 pounds of hay in 1908, killed considerably but made a fair stand. The uninoculated area was completely killed out. Two plots of about one half-acre each were seeded in 1908 on another part of the Farm. One was common alfalfa and the other was Turkestan and both received similar treatment. The plot of Turkestan alone survived the spring. Soil from a field which had grown inoculated alfalfa one year was used to inoculate both plots, the soil on which the alfalfa was to be sown being black clay loam fall-ploughed out of oat stubble. The inoculation did not take evenly, the crop showing irregular growth and yielding only a little over a half ton per acre. In another case, where the seed bed was in better condition, soil from the same field effectively inoculated the new area. The conclusion is, that it is unsafe to use soil for inoculating from a field which has been inoculated but which has grown the alfalfa but one year. Another lesson which may be drawn is, that the seed-bed should be in the best of condition, preferably a summer-fallow of the previous year or fall-ploughed stubble, well worked till June, when the alfalfa may be sown.

Three plots of Turkestan alfalfa were sown in 1908, on land that had been used for a garden for some years. This land had received applications of barnyard manure in previous years and was in a good state of cultivation. One plot was inoculated with soil from a field which had grown inoculated alfalfa but one year. One plot was inoculated by means of culture from the laboratory in connection with the Department of Agriculture of the province. One plot was not inoculated. Following are the results:—

Alfalfa—Inoculation with Soil and with Culture.

—	Cutting Date.	Green per Acre.		
		Un-inoculated.	Inoculated with Soil.	Inoculated with Culture.
		Lbs.	Lbs.	Lbs.
First cutting	July 22	6,300	8,700	5,220
Second cutting	Sept. 11	1,920	1,860	1,560
Total		8,220	10,560	6,780

—	Cutting Date.	Dry per Acre.		
		Un-inoculated.	Inoculated with Soil.	Inoculated with Culture.
		Lbs.	Lbs.	Lbs.
First cutting	July 22	3,300	4,260	2,700
Second cutting	Sept. 11	780	840	660
Total		4,080	5,100	3,360

Very dry weather reduced the yield of the second cutting.

Small amounts of seed of various hardy sorts of alfalfa were received from the Central Experimental Farm and sown this season. A six-acre field of Turkestan alfalfa was also started, so that, if successful, a quantity of fodder will be available for feed next winter.

GRASSES—RED CLOVER, ALSIKE AND TIMOTHY.

In 1908, twelve one-third acre plots were seeded to grasses and clovers. The seed of some of these varieties was not good and consequently the stand was poor and the yields were not as high as might have been expected under favourable conditions. The alsike and timothy plot was not seeded intentionally but made, nevertheless, a splendid crop of fine hay. There was in the alsike seed a small quantity of timothy which came on, making a very good combination, judging from the yield as well as from the quality of hay produced.

No.	Variety.	Yield per Acre.
		Lbs.
1	Timothy and Alsike	4,632
2	Red Top Grass	3,972
3	Brome Grass	3,702
4	Western Rye Grass	2,972
5	Red Clover	2,552
6	Timothy	2,474
7	Canadian Blue Grass	2,016
8	Orchard Grass	2,012
9	Kentucky Blue Grass	1,625
10	Turkestan alfalfa, (inoculation failed to take)	1,020
11	Common alfalfa	Winter-killed.
12	Meadow Fescue	Seed poor ; no crop.

EXPERIMENTS WITH INDIAN CORN.

Seventeen varieties of Indian Corn were planted on black clay loam, on May 25, and two varieties on May 31. Manitoba No. 1 was also planted in a favoured location, where it produced a small quantity of seed.

The seed was planted in hills 2½ feet apart each way and the crop was cultivated each way during the early part of the season. The yield was computed from the product of two rows, each 66 feet long.

INDIAN CORN—Test of Varieties.

No.	Variety.	Date Sown.	Date Cut.	Height.	Condition when Cut.	Weight of green Fodder per Acre.	
						Tons.	Lbs.
1	Eureka	May 25	Aug. 28	70	Well tasseled	15	826
2	Longfellow	" 25	" 28	70	"	15	202
3	Compton's Early	" 25	" 23	74	Just tasseling	14	811
4	Angel of Midnight	" 25	" 28	71	"	13	717
5	Mammoth Cuban	" 25	" 28	69	Not tasseled	13	252
6	Champion White Pearl	" 25	" 28	72	"	12	1,555
7	Selected Leaming	" 25	" 28	72	Just tasseling	12	277
8	Wood's Northern Dent	" 25	" 28	70	Not tasseled	11	1,696
9	North Dakota White	" 25	" 28	67	Well tasseled	11	767
10	Salzer's all Gold	" 25	" 28	70	Not tasseled	10	1,141
11	Early Mastodon	" 25	" 28	68	"	10	792
12	Triumph	" 25	" 23	67	Just tasseling	10	211
13	Mercer	" 25	" 28	69	"	9	433
14	Northwestern Dent	" 25	" 28	67	Well tasseled	9	120
15	White Cap Yellow Dent	" 25	" 28	69	Just tasseled	8	1,271
16	Superior Fodder	" 25	" 28	70	Not tasseled	8	959
17	Davidson	" 25	" 28	60	Well tasseled	8	959
18	Manitoba No. 2	" 31	" 28	60	In silk	7	1,333
19	Manitoba No. 1 sown separately	" 31	Sept. 15	68	Ripe	9	4

EXPERIMENTS WITH FIELD ROOTS.

All the root crops of 1909 were grown on clay loam, ploughed after brome hay was harvested in 1908. The land was packed after the plough and well worked in the fall of 1908 as well as in the spring of 1909. The dry weather toward the close of the season checked late growth. The yields are computed from the weight of roots on two rows each 66 feet in length and 30 inches apart.

TURNIPS.

Twelve varieties were tested this year. The seed was sown in drills two and one-half feet apart and the young plants were thinned out to 10 or 12 inches apart in the row. The seed was sown on May 25 and June 8 and the roots were harvested October 27.

TURNIPS—Test of Varieties.

Number.	Variety.	Yield per Acre. 1st Plot. Tons.	Yield per Acre. 1st Plot. Lbs.	Yield per Acre. 1st Plot. Bush.	Yield per Acre. 1st Plot. Lbs.	Yield per Acre. 2nd Plot. Tons.	Yield per Acre. 2nd Plot. Lbs.	Yield per Acre. 2nd Plot. Bush.	Yield per Acre. 2nd Plot. Lbs.
1	Good Luck	13	136	435	36	7	124	235	24
2	Magnum Bonum	13	4	433	24	5	956	182	36
3	Halewood's Bronze Top	12	1,872	431	12	6	1,728	228	48
4	Bangholm Selected	12	1,740	429	0	6	1,728	228	48
5	Hall's Westbury	12	684	411	24	6	1,860	231	0
6	Hartley's Bronze	12	24	400	24	7	388	239	48
7	Mammoth Clyde	11	1,232	387	12	7	1,180	253	0
8	Skirving's	10	592	343	12	5	824	180	24
9	Kangaroo	9	668	311	8	4	372	139	32
10	Jumbo	9	216	303	36	3	1,524	125	24
11	Carter's Elephant	8	1,556	292	36	4	1,504	158	24
12	Perfection Swede	7	1,180	253		4	844	147	24

MANGELS.

Ten varieties of mangels were sown on May 24 and June 7 in drills two and one-half feet apart. The stand of plants secured was not uniform but, when thinning was necessary, plants were left from 8 to 10 inches apart in the row. Both plots were pulled October 2.

MANGELS—Test of Varieties.

Number.	Variety.	Yield per Acre. 1st Plot. Tons.	Yield per Acre. 1st Plot. Lbs.	Yield per Acre. 1st Plot. Bush.	Yield per Acre. 1st Plot. Lbs.	Yield per Acre. 2nd Plot. Tons.	Yield per Acre. 2nd Plot. Lbs.	Yield per Acre. 2nd Plot. Bush.	Yield per Acre. 2nd Plot. Lbs.
1	Half Sugar White	7	1,312	255	12	3	336	105	36
2	Perfection Mammoth Long Red	6	276	204	36	3	864	114	24
3	Selected Yellow Globe	6	144	202	24	4	1,900	165	0
4	Mammoth Red Intermediate	5	1,748	195	48	2	1,280	88	0
5	Gate Post	5	428	173	48	3	1,524	125	24
6	Giant Yellow Intermediate	5	296	171	36	1	1,960	66	0
7	Giant Yellow Globe	4	1,966	166	6	3	1,788	129	48
8	Crimson Champion	4	1,834	163	54	2	1,280	88	0
9	Prize Mammoth Long Red	4	844	147	24	3	1,656	127	36
10	Yellow Intermediate	3	1,524	125	24	4	844	147	24

CARROTS.

Four varieties of carrots were under test. The seed was sown on May 24 and June 7 in drills two and one-half feet apart, and the young plants were thinned out to from 5 to 7 inches apart in the row. The roots were harvested October 2.

CARROTS—Test of Varieties.

Number.	Variety.	Yield per Acre.				Yield per Acre.			
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	7	520	242	0	3	864	114	24
2	Improved Short White	7	256	237	36	3	1,128	118	48
3	White Belgian	7	124	235	24	3	1,392	123	12
4	Half-Long Chantenay	6	926	215	36	3	1,656	127	36

SUGAR BEETS.

Three varieties of sugar beets were under test. Two sowings were made, the first on May 24 and the second on June 2. The soil and cultivation were similar to those of the other root tests. An improvement in sugar-content is shown this year.

SUGAR BEETS—Test of Varieties.

Number.	Variety.	Yield per Acre.				Yield per Acre.				Per cent. Sugar in Juice.	Per cent. Solids in Juice.	Co-efficient of Purity.
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.				
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	%	%	
1	Vilmorin's Improved	5	296	171	36	3	996	116	36	13·16	19·17	68·6
2	Klein Wanzleben	4	1,768	162	48	2	884	81	24	11·83	15·43	76·7
3	French Very Rich	4	448	140	48	3	1,656	127	36	13·33	16·47	80·9

POTATOES.

Twenty-five varieties of potatoes were under test this year. They were plantd on May 24 in rows 30 inches apart, and the cuttings were dropped from 12 to 14 inches apart in the row. Level cultivation was given throughout the season and, though the yields of tubers were not large, the quality has not been equalled in former years. The soil was a black clay loam, ploughed out of brome stubble after the hay was cut in 1908. The land was top-dressed with manure in the spring of 1908. In the fall of 1908 and the spring of 1909, thorough cultivation was given. There was no rot in any of these plots.

Roots and potatoes are being grown on brome grass sod, not because of its suitability for growing these crops, but because of the suitability of these crops for destroying brome grass.

The yield per acre was estimated from the product of two rows, each 66 feet long.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Dug.	Average Size.		Quality.	Total Yield per Acre.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable.		Form and Colour.
						Bu.	Lbs.	Bu.	Lbs.	Bu.	Lbs.	
1	British Queen	Sept.	7	Small	Good	331	6	225	0	106	6	White, oval.
2	Everett	"	8	Medium	"	311	8	248	8	63	..	Red, oval.
3	Country Gentleman	"	7	"	"	292	36	223	25	69	11	White, long.
4	Ashleaf Kidney	"	7	"	"	289	18	202	8	87	10	Pink, oval.
5	Morgan Seedling	"	9	"	"	287	6	218	6	69	0	Pink, long.
6	Rochester Rose	"	9	"	"	282	42	225	35	57	7	" "
7	Money Maker	"	9	"	Medium	275	0	235	0	40	0	White, long.
8	Table Talk	"	8	Small	Good	275	0	143	0	132	0	White, oval.
9	Holborn Abundance	"	8	Medium	"	273	54	207	40	66	14	" "
10	Empire State	"	9	"	"	268	24	202	17	66	7	" "
11	Gold Coin	"	9	"	Medium	267	18	192	14	75	4	" "
12	American Wonder	"	8	Large	"	265	6	243	5	22	1	" "
13	Irish Cobbler	"	9	Medium	"	264	0	190	0	74	0	White, round.
14	Reeves' Rose	"	9	"	Good	255	12	214	9	41	3	Red, oval.
15	State of Maine	"	9	"	"	242	0	193	0	49	0	White, oval.
16	Pioneer	"	9	Small	Medium	239	48	149	32	90	16	" "
17	Uncle Sam	"	8	Medium	Good	224	24	161	18	63	6	" "
18	Carman No. 1	"	9	"	Medium	223	18	187	14	36	4	" "
19	Dooley	"	8	Large	"	212	18	195	16	17	2	" "
20	Late Puritan	"	9	Medium	"	193	36	154	29	39	7	" "
21	Dalmeny Beauty	"	9	"	Good	190	40	159	34	31	6	White, long.
22	Uncle Gideon's Quick Lunch	"	9	Small	Medium	182	36	94	20	88	16	White, round; Pink eye.
23	Dreer's Standard	"	9	"	"	181	30	115	19	66	11	White, oval.
24	Twentieth Century	"	10	Medium	"	173	04	131	3	42	1	" "
25	Vicks Extra Early	"	9	"	Good	137	52	98	40	39	7	" "

APPLICATION OF FERTILIZERS TO POTATOES.

The following experiments with fertilizers as applied to potatoes were conducted. The superphosphate of lime and sulphate of potash for the plots of grain reported on on a previous page, and for the second in the series of potatoes treated with artificial fertilizers were kindly supplied by the Brackman-Ker Elevator Company, Alberta, representative of the Dominion Potash Syndicate, Toronto, Ontario.

POTATOES—Application of Fertilizezrs.

Variety.	Fertilizer.	Total Yield.		Yield per acre. Marketable.		Yield per acre. Unmarketable	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Holborn Abundance	None	212	18	161	13	51	5
" "	561 lbs. Superphosphate of Lime 111 " Sulphate of Potash	270	36	237	30	33	6
Ashleaf Kidney	None	247	30	167	20	80	10
" "	330 lb.. Acid Phosphate 132 " Nitrate of Soda 198 " Muriate of Potash Sulphate of Potash 198 lbs.	280	30	224	24	56	5
" "	330 lbs. Acid Phosphate 132 " Nitrate of Soda	275	0	198	0	77	0

POTATOES—DEPTH OF PLANTING.

Country Gentleman potatoes were planted 2, 4 and 6 inches deep with the following results:—

POTATOES—Depth of Planting.

Variety.	Total Yield.		Yield per Acre.			
			Marketable.		Unmarketable	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Country Gentleman—						
2 inches deep	299	12	227	8	72	4
4 " "	312	24	249	21	63	3
6 " "	246	24	206	22	40	2

APPLE ORCHARD.

The apple trees made a good growth during the season of 1909, and most varieties ripened their wood fairly well. None of the trees are of bearing age.

SMALL FRUITS.

The fruit bushes set out in 1907 were permanently placed in 1909. Small quantities of red and black currants and red raspberries were produced. The fruit was of good size and fine quality. The strawberry plantation, set out in 1908, fruited this year and produced berries of great size and fine flavour. The stand of plants was uneven, hence the yield was not as heavy as might otherwise have been expected, but the berries were very large, one reaching 7¼ inches in circumference. The varieties yielding the highest were Senator Dunlap, Beder Wood, Haverland, Ruby and Glen Mary. The single hedge-row system was tried in comparison with the matted-row system. The matted-row system gave the larger yields this year in every instance. The season extended from July 10 to August 15.

TREE PLANTING.

Four miles of trees were planted around the boundaries of the Farm, which completed the circuit with the exception of three rows about one-quarter of a mile long. The varieties used this year were Ash and Manitoba Maple for the two rows next to the line fences. The third row was planted with the idea of lending variety to the border. Among the shrubs planted, Loniceras, Syringas, Spireas and Caraganas are prominent, while different varieties of Spruce and Pine are the most important of the trees planted in this row.

THE VEGETABLE GARDEN.

The season was favourable for the growth of vegetables. The following varieties were tested and are named in order of merit.

Beans—
- Golden Wax,
- Matchless,
- Emperor of Russia,
- Every Day,
- Flageolet,
- Edible Podded.

Beets—
- Egyptian,
- Nutting's Dwarf Improved,
- Half-long,
- Long Smooth Blood.

Carrots—
French Horn,
Improved Nantes.
Cabbage—
Large Flat Drumhead,
Early Jersey Wakefield,
Fottler's Improved Brunswick.
Onions—
Paris Silverskin,
Extra Early Red,
Large Red Wethersfield.
Radish—
Olive Scarlet,
Turnip Forcing,
Turnip Scarlet.

Celery—
Paris Rose-ribbed,
Giant Pascal.
Cauliflower—
Early Snowball,
Extra Early Select Erfurt.

Lettuce—
Cos Trianon,
Neapolitan,
Wheeler's Tom Thumb.
Peas—
Melting Marrow.
Table Turnips—
Extra Early White Milan.

FLOWER GARDEN.

This year the flower garden succeeded well and bloom was good till the last of September. The seed was sown in the hot-bed on April 29, and the plants were set in the open ground June 23. The seed of Larkspur, Mignonette, Poppy and Sweet Peas was sown in the open.

Variety.	Sown in hot-bed.	Planted in open.	Remarks.
Asters	April 29	June 23	Fine bloom.
Brachycome	" 29	" 23	"
Balsam	" 29	" 23	"
Candytuft	" 29	" 23	"
Coreopsis	" 29	" 23	"
Dianthus	" 29	" 23	"
Eschscholtzia	" 29	" 23	"
Godetia	" 29	" 23	"
Larkspur	In open	In open	"
Mignonette	"	"	"
Poppy	"	"	"
Sweet Peas	"	"	"

PANSIES.

This season produced the finest pansies we have had. The varieties worthy of special mention are Lord Beaconsfield, Giant Trimardeau and Giant Hercules.

BULBS.

Owing to the fact that the bulbs were planted after the land was frozen in the fall of 1908, they did not produce roots till spring. The bloom was not strong, the Tulips being only fair, while the Crocuses and Snowdrops were a failure.

CATTLE.

The two dairy cows have been in good health during the year. There is also one heifer two years old and a heifer calf, both of which are in good condition.

FEEDING FOR BEEF.

With the view of maintaining the fertility of the land and at the same time of finding a use for a quantity of frosted spring wheat which was being held over from 1907, and which was not marketable at more than 35c. per bushel, a car load of steers were purchased and put on feed in December, 1909. Besides the frosted wheat, the screenings from the oats and barley used for seed constituted a small proportion of the grain ration. Upland prairie hay was fed during the first ten weeks and timothy hay at the finish. The hay was fed in racks which were kept full. The change from upland to timothy was not made out of preference for the latter, for it is believed that well cured upland hay will give as good, if not better, results than well-cured timothy. The cost is figured at the market value of these hays in Lacombe at the time they were being fed. Three dollars per ton is rather above the cost of upland hay to most feeders, whereas $6 for upland and $7 per ton for timothy is charged against this bunch of cattle. The cost of chop is fixed at 40c. per bushel of 60 pounds or ⅔ of a cent per pound. This, while a lower figure than good chop is worth, is sufficient to pay for the cost of grinding and handling and pay the market price for frosted wheat of 35c. per bushel. Chop made from fully matured or only slightly frosted grains would have produced better gains than were secured from this grain, which was badly frozen.

The cattle were two and three-year-olds, a mixed bunch as regards breed and also as to adaptability for feeding. Shorthorn, Hereford and Galloway bloods were represented. A lot averaging much better could have been secured earlier in the season, as the best feeders had been picked up by the date these were secured. Twelve were put on feed December 8, four on December 15 and three December 23, making a total of nineteen head. One steer died during the test. They averaged 1,130 pounds and cost 3½c. per pound, weighed on arrival. Freight charges and travelling expenses brought the cost up to 3·658 cents per pound, or $744.01. Grain was fed in the beginning at the rate of 3 pounds per head per day, and was gradually increased until by February 26 they were getting 16½ pounds per head per day. This was practically full feed and, during warm weather, had to be reduced, as the aim was to feed only what they would clean up in an hour.

They were fed outside in the corral and had access to a shed which was seldom used. The only expense was for lumber to build hay racks, grain tables, and for a water tank and tank heater which prevented the formation of ice on the water. The total cost of time was 222 hours. The time necessary is evidence that outside feeding may be carried on at small expense for labour as well as for equipment.

The following table gives the results:—

SUMMARY OF RESULTS.

Number steers in lot		18
Gross weight weighed in	lbs.	20,337
Average weight per head weighed in	"	1,130
Number of days fed		109
Gross weight weighed out March 30	lbs.	23,720
Average weight weighed out March 30	"	1,318
Total gain in 109 days	"	3,383
Average gain per head	"	188
Average daily gain per head	"	1·72
Average cost per 100 pounds gain	$	7 42
Value per bushel of frozen wheat fed and marketed as beef		1 28½
Interest on investment for buildings and necessary shelter		——

View of Barn—Experimental Farm, Lacombe, Alta.

16—p. 488

COST.

18 steers average weight 1,130 pounds at 3·658 cents per lb.	$ 744 01
26,216 pounds prairie hay at $6 per ton..	78 65
9,123 pounds of timothy hay at $7 per ton..	31 93
20,810 pounds frozen wheat chop at ⅔ of one cent per lb..	138 73
145 pounds salt..	1 75
The cost of 222 hours of labour and interest ($18.75) on money invested in cattle is not figured, but it is more than covered by value of manure available for application on the land.	
Total cost..	$ 995 07

RECEIPTS.

Sold 18 steers, total weight 23,720 pounds, 23,720 pounds less 5 per cent at $5.75 per 100 pounds..	$1,295 70
Profit on gain of two pigs following steers during last six weeks of feeding..	4 75
Total receipts..	$1,300 45
Total cost..	995 07
Total profit..	$ 305 38
Average profit per head..	$ 16 97
NOTE.—Loss of one steer, 1,130 pounds at 3·658 cents plus value of hay and chop consumed..	$49 69
Less 51 pounds hide at 5 cents per lb..	2 55
	$47 14
Profit of $305.38, less $47.14..	$258 24
Average profit per head after covering this loss..	14 35

Perhaps a few conclusions may be safely drawn from this work.

1. Expensive equipment is unnecessary as outside feeding is profitable.

2. Frozen wheat or other grain otherwise unsaleable or only as low grade may be marketed on foot at a good price.

3. When mixed farming is practised and the grain produced is fed and the manure returned to the land, there is no dangerous deterioration of the fertility of the soil. The additional source of revenue caused by feeding a part of the grain produced on the farm constitutes an element of safety. The time to commence to conserve the fertility of the soil is before the need of such conservation becomes evident.

4. It is safer to bring steers three years old to full feed than steers two years old. This must not be understood as a statement that all two year old steers will not stand full feed. It will depend on the constitution of the individual animal. Two two-year-old steers could not stand the amount of feed that the three-year-olds handled without difficulty. One of these gradually failed and finally constituted a loss, while the second was brought back to fair gains after some difficulty.

HORSES.

The four heavy horses have been in good health during the year. The average 7 feet and ½ inches in girth and 1,685 pounds in weight. During the year they have

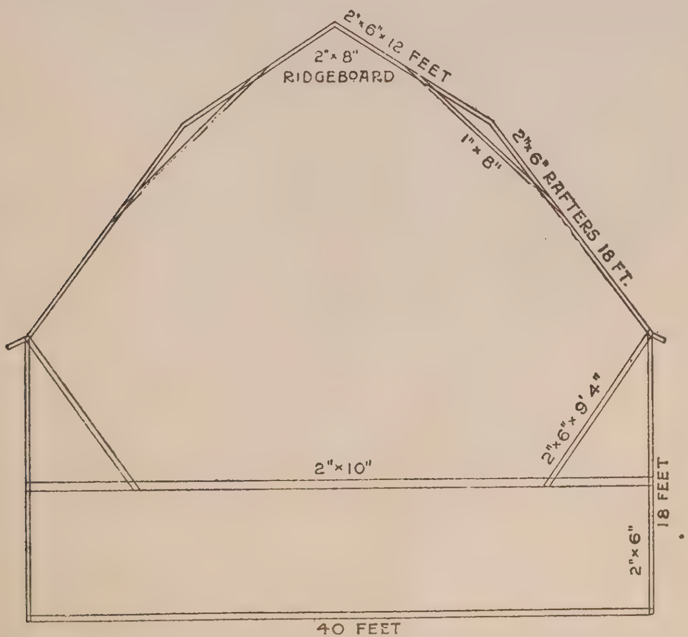
Ground Plan of Barn, Experimental Farm Lacombe.

worked 3,178 hours. The general purpose team are in good health as is also the heavy draught filly two years old.

PLAN OF BARN.

The plan of the barn is presented herewith. The feature which is considered most deserving of attention is the self-supporting hip roof which provides more space for the money than any other style of roof with which the writer is familiar. Though subjected to the strain of a number of high winds it has so far given no sign of weakness and carries an unloading track without difficulty.

As shown in the plan, the first run of rafters is 18 and the second run 12 feet in length, giving a total length of rafter of 30 feet on each side of the barn. The rafters are 2 inches x 6 inches and are set at 2 feet centres. The two runs constituting the side are securely nailed together before being raised. The proper pitch being secured, stakes are driven into the ground on both sides of each end of each run, then one of the ties at the break is nailed. This method insures all the rafters being exactly the same pitch without taking time to determine pitch for each pair. The 2-inch x 8-inch plank at the ridge, from which the track is later hung, is held in place from a scaffolding erected inside the barn, the rafters are raised and spiked securely to this plank. The loft in this barn is 28 feet from ceiling above the horses to ridge and will hold a large amount of feed.



The studding is also 2-inch x 6-inch 2-foot centres, the ties from the wall to the joist are 2 inches x 6 inches and 6 feet apart. The joist are 2 inches x 10 inches on 2-foot centres. The building stands on four concrete walls.

There is a large bias over feed room for storing, connected with the latter by a stop spout feeding into a small box.

Manger 1½ feet wide at the bottom, sloping inward towards passage.

The barn was built in 1907 at a cost of $2,031 complete. The lumber, hardware, building paper, gravel and cement were estimated to cost $1,524.65 and labour the balance, $506.35. Gravel cost $3 per yard delivered, while lumber and cement were also high-priced. No. 1 material only was used.

CORRESPONDENCE.

From April 1, 1909, to March 31, 1910, 4,248 letters were received and 3,571 answered.

MEETINGS ATTENDED.

This Farm was represented at the Edmonton Exhibition, occupying a tent on the grounds. An exhibit of alfalfa growing, alfalfa hay, alfalfa meal and weed seeds commonly found in alfalfa seed was made. Charts giving the results of certain experiments were also a feature, and literature was available to those interested. The tent was visited by a large number of farmers.

I attended the Irrigation Convention at Lethbridge, Alta., on August 6, and from there judged the standing fields of grain entered in the competitions held by the Raymond and Innisfail Agricultural Societies. I also assisted in judging the Good Farms Competition held by the Red Deer Agricultural Society. I acted as judge and spoke at the seed fairs held at Edmonton, Leduc, Daysland, Sedgewick, Irma, Red Deer, Bowden, Olds, Didsbury, and the Provincial Seed Fair at Edmonton. I delivered six lectures in connection with the short course conducted by the Provincial Department of Agriculture at Olds.

EXCURSION.

On July 20 an excursion visited the Farm. Special trains were run from Calgary and Edmonton, the regular Wetaskiwin branch train connecting with the special. The Provincial Department of Agriculture did the advertising and arranged the reduced fares. The number of people visiting the Farm was not large, totalling about seven hundred. Addresses were delivered by Senator Talbot, George Harcourt, W. C. McKillican, H. A. Craig, W. F. Stevens and the Superintendent. The visitors were also shown over the Farm as thoroughly as possible in the time at their disposal.

ACKNOWLEDGMENT.

At the close of last year Mr. C. E. Craig, who had efficiently discharged the duties of foreman for two years, left to undertake the management of a fruit farm in British Columbia. Mr. R. E. Everest has since been satisfactorily occupying this post. Mr. S. Edmunds, who has been employed on the Farm from the first, has earned my thanks for his careful and interested work.

DISTRIBUTION OF SAMPLES.

One hundred and ten thousand seedlings of Manitoba Maple and Caragana were distributed in the spring of 1909. There are about 100,000 ready for distribution in 1910.

The number of applications for grain and potatoes have increased over those of last year when 195 samples were distributed. The following have been sent out during the year.

Winter wheat	181
Spring wheat	264
Oats	219
Barley	110
Potatoes	541
Total	1,315

BUILDINGS.

An extension to the machine shed was erected This addition is 50 feet long by 20 feet in width.

METEOROLOGICAL RECORD.

Months.	Highest Temperature.	Date.	Lowest Temperature.	Date.	Total Precipitation.	Total Hours Sunshine.
1909.						
April	58 3	25th	3·9	12th	·275	213·
May	81·3	3rd	16·9	8th	2·63	199·4
June	80	16th	30·9	7th	2·24	313·7
July	82·8	22nd	37·6	20th	4·28	300·
August	86·5	14th	29·4	28th	·91	325·2
September	84·5	6th	23·9	27th	·43	227·1
October	76·1	5th	9 8	11th	1·05	143·5
November	53·6	2nd	—19·	25th	·37	113·5
December	45·	29th	—23·1	7th	·82	90·3
1910.						
January	47·1	30th	—24·1	1st	·73	115·6
February	41·1	4th	—38·	21st & 22nd	·59	155·
March	65·6	22nd	— 5·5	1st	·33	202·9
Totals					14·655	2,399·2

I have the honour to be, sir,

Your obedient servant,

G. H. HUTTON,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOS. A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., March 31, 1910.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith my report for the year ending March 31, 1910.

The winter of 1908-9 was the severest for many years and the spring was late, with cold drying winds from the north, northeast and northwest. This weather was very trying to the meadows, which had already sustained considerable injury from the ice-covering which lay over them for two weeks in January. Newly-seeded clover was almost destroyed by the heaving of the wet ground, from the frosts of January and February.

The cold, drying winds continued, with a very light rainfall until well on in June, when the weather became warmer and more summer-like, but still dry, the rainfall being very light until the harvest was well forward.

Owing to the unfavourable winter and spring, the hay crop in 1909 was the lightest in many years. The grain crops were fairly good and the grain was plump and harvested in good condition. As usual, the Indian corn did not make very much growth until July, and, as a consequence, it was very immature when cut for filling the silo, very few varieties being farther advanced in growth than to the formation of ears and none produced good ears of glazed corn.

November was the wettest on record, our rainfall for that month being 20·88 inches and the land was flooded as the greater portion of the month's precipitation came in the last few days.

December was mild and the rainfall comparatively light. January, February and March have been mild, the lowest temperature for the winter having been 10 degrees above zero, on February 21 and 22.

March throughout has been cool, cloudy and showery with less than the average amount of sunshine. Growth, which in the beginning of the month promised to be early, has been backward. The grass has not grown much, a few varieties of trees show leaves and only the Japanese plums are in bloom at the close of the month.

FALL WHEAT.

Seven varieties of fall wheat were sown in the variety test. The previous crop was clover, the first cutting of which was made in June and the aftermath turned under in August. The land was tilled with the disc and spike-toothed harrows. The seed was sown at the rate of one and one-half bushels per acre. It was treated with formalin to kill all smut germs and sown September 16. The seed germinated well and the stand was promising, but when the ground was very wet early in January,

we had a frost accompanied with a cold rain which formed a sheet of ice from 2 to 3½ inches thick. This remained on the ground nearly two weeks and the fall wheat crop was destroyed.

FALL RYE.

Four varieties of fall rye were sown on October 7 alongside of, and on soil treated the same way as for the fall wheat tests.

The seed was treated with formalin and was sown at the rate of one bushel and a peck per acre; it germinated well and the promise of a crop was very good, but the ice smothered it as it did the wheat, and the land was resown to spring grain.

There is not enough rye grown in this locality to load a car for shipment and the grain is not relished as a feed by any class of stock; there is no market for rye straw so that this grain is not of value here, except as a soiling crop in spring.

EXPERIMENTS WITH SPRING WHEAT.

Twelve varieties of spring wheat were grown in the test series this year. The seed was treated with formalin before sowing and all plots, which were one-fortieth of an acre each, were sown on April 8, at the rate of one and one-half bushels per acre. They were located in one of the apple orchards which had a cover crop of clover ploughed down in June of the previous year and a light dressing of stable manure applied in the autumn. This was well disced into the soil before the wheat was sown. Although there was some injury by the midge and also by the shade of the apple trees, yet the yield was fair and the grain plump and bright, as the weather was favourable before and during harvest.

No smut or rust was observed on any of the varieties.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Average length of Straw including Head.	Character of Straw.	Average length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs.
1	Pringle's Champlain..	Aug. 16.	122	48	Strong....	3	Bearded..	3,910	28	57	62½
2	Percy..............	" 17.	123	46	" ...	3½	Beardless.	3,900	24	36	62
3	Preston............	" 20	126	46	" ...	4	" ..	3,650	24	18	64½
4	Stanley............	" 20.	126	48	" ...	3½	" ..	4,287	24	15	61
5	Bishop.............	" 21.	127	44	Medium..	3½	" ..	4,503	23	15	63
6	Red Fife...........	" 21.	127	45	Strong...	3	" ..	4,261	22	05	62½
7	Marquis............	" 16.	122	42	Medium..	3	" ..	2,995	21	43	64
8	Huron..............	" 20.	126	45	Strong...	3	Bearded..	3,575	21	8	64½
9	Chelsea............	" 21.	127	43	" ...	3	Beardless.	4,085	20	30	64½
10	White Fife.........	" 21.	127	40	Medium..	3	" ..	4,355	20	21	62¼
11	Hungarian White....	" 23.	129	46	Strong...	3	Bearded..	3,740	20	6	64
12	Riga...............	" 21.	127	42	Medium..	3	Beardless.	3,160	19	0	64

EXPERIMENTS WITH OATS.

Twenty-two varieties of oats were sown on April 19 at the rate of 2½ bushels per acre. The seed was treated with formalin and the crop was free from smut or rust. The plots were located in one of the apple orchards on a sandy loam soil, clover being sown with the oats. The yield was much more uniform than that of last year; the

straw was bright and stiff and the grain plump, owing to the favourable weather. The plots were each one-fortieth of an acre in size.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No of Days Maturing.	Length of Straw Including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning
					Inch.		Inch.		Lbs.	Bush.	Lbs.	Lbs.
1	Improved American..	Aug	16	119	48	Strong.	10	Branching	2,140	90	24	36
2	Tartar King.........	"	12	115	43	"	10	Sided.....	2,600	90		36
3	Milford White.....	"	16	119	44	"	9	"	2,640	89	14	38
4	Banner....	"	19	119	45	"	9	Branching	2,520	88	8	38
5	Virginia White.......	"	13	113	49	"	10	"	2,660	87	22	35
6	Kendal White.......	"	16	119	50	"	11	Sided-....	2,760	85	30	35
7	Thousand Dollar	"	16	119	42	"	10	Branching	2,840	83	18	40½
8	Abundance..........	"	14	117	48	"	11	"	2,280	82	12	39
9	Improved Ligowo....	"	13	116	44	"	10	"	2,600	82	12	40½
10	Lincoln............	"	16	119	47	"	10	"	2,290	80	30	34¾
11	'Regenerated' Abundance	"	13	116	48	"	11	"	2,540	80	20	41½
12	Swedish Select.	"	12	115	44	"	10	"	2,640	80	—	35½
13	Irish Victor..........	"	12	115	48	"	10	"	2,140	80	—	35
14	White Giant,........	"	16	119	41	"	10	"	2,720	77	22	37
15	Twentieth Century...	"	12	115	43	"	10	"	2,506	75	30	38½
16	Siberian....	"	17	120	46	"	10	Sided... ..	2,820	74	4	38
17	Storm King.........	"	16	119	46	"	11	"	3,100	72	12	36
18	Golden Beauty.......	"	18	121	42	"	9	Branching	3,280	71	26	33½
19	Pioneer.........,....	"	12	115	44	"	10	"	3,280	70	20	40¾
20	American Triumph...	"	12	115	48	"	11	"	3,140	70	6	37
21	Wide Awake	"	17	120	42	"	10	"	3,200	64	21	40¾
22	Danish Island........	"	17	120	46	"	11	"	2,960	63	18	39½

EXPERIMENTS WITH BARLEY.

Ten varieties of six-rowed and ten varieties of two-rowed barley were sown in the test plots this year, on April 19. The seed was treated with formalin and sown at the rate of two bushels per acre. The land had been in Indian corn the previous year and had received a dressing of stable manure for that crop.

The growth was strong, the grain plump and the yield fairly good. No smut or rust was observed on any of the plots, which were each one-fortieth of an acre. The soil was a sandy loam.

SIX-ROWED BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Nugent	Aug.	9..	112	40	Medium..	2½	3,000	55	40	47½
2	Odessa	"	2..	105	43	Strong ...	3	2,840	54	8	50½
3	Oderbruch...............	July	31..	103	42	" ...	3½	3,440	51	2	52
4	Stella	Aug.	6..	109	42	Medium..	3	3,200	50	40	51
5	Yale.	"	2..	105	46	Strong ...	3	2,940	50	30	52½
6	Mensury.................	"	4..	107	44	" ...	3½	2,980	50	20	47¾
7	Trooper	"	5..	108	40	Medium..	3	2,760	43	6	
8	Mansfield	"	4..	107	42	" ..	3½	2,760	42	24	50
9	Claude...........	"	4..	107	40	Weak	3	3,400	35	40	52½
10	Albert	"	3..	106	40	"	2½	3,420	34	28	52

TWO-ROWED BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after Cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Canadian Thorpe	Aug. 10	113	46	Strong	4	3,280	55		53½
2	Beaver	" 7	110	40	"	4	2,940	53	36	54½
3	Danish Chevalier	" 9	112	44	"	5	3,260	51	12	53
4	Swedish Chevalier	" 12	115	44	Medium	4	2,900	49	28	50
5	Standwell	" 9	112	45	Strong	5	3,080	49	8	51½
6	Jarvis	" 9	112	41	"	5	3,360	46	32	50½
7	Invincible	" 11	114	46	"	5	2,840	45	40	53½
8	French Chevalier	" 11	114	44	Medium	4½	3,060	40	20	50¾
9	Gordon	" 7	110	43	"	4	2,920	36	32	50½
10	Clifford	" 7	110	40	Strong	3	3,240	35	40	54

EXPERIMENTS WITH PEAS.

Fifteen varieties of peas were included in this test in 1909. All were sown April 19 on freshly-ploughed clover sod. There had been a heavy aftermath of clover covering the ground in the fall of 1908, which was starting growth when turned under in the spring of 1909. All plots were one-fortieth of an acre in size.

The large varieties were sown at the rate of three bushels per acre and the small at the rate of two and one-half bushels. All varieties were well podded and the pods well filled except the Arthur, which was not so well podded as the other varieties this year.

A half-acre plot of Golden Vine peas was sown on the same date and harvested August 20, yielding at the rate of 55 bush. 10 lbs. per acre.

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening	Number of days Maturing.	Character of Growth.	Average length of Straw.	Weight of Straw.	Average length of Pod.	Size of Pea.	Yield per Acre.		Weight per measured Bushel after Cleaning.
					In.	Lbs.	In.		Bush.	Lbs.	Lbs.
1	Mackay	Aug. 18	121	Strong	60	2,440	3	Medium	54	40	63½
2	White Marrowfat	" 21	124	"	56	2,400	3	Large	49	20	63
3	Paragon	" 23	126	"	64	3,120	3½	"	46	40	64¼
4	English Grey	" 21	124	"	54	2,900	3	Medium	46	20	63
5	Wisconsin Blue	" 14	117	"	60	2,960	3	Small	45	20	63½
6	Daniel O'Rourke	" 16	119	"	50	2,480	2½	"	42	40	63½
7	Early Britain	" 16	119	"	54	3,140	3	Medium	42	40	62¼
8	Prince	" 18	121	"	56	3,360	3	Large	42		63
9	Prussian Blue	" 19	121	"	53	3,000	3	Medium	41		64½
10	Picton	" 91	124	"	52	3,660	3	"	40	20	64
11	Victoria	" 21	124	"	53	3,200	3	"	40		64
12	Black-eye Marrowfat	" 19	121	"	56	3,480	3½	Large	36	40	63½
13	Chancellor	" 19	121	"	52	4,000	3	Small	34		65
14	Gregory	" 20	122	"	54	4,640	3½	Large	30		64
15	Arthur	" 14	117	Weak	49	3,600	2½	Medium	27	20	63½

EXPERIMENTS WITH INDIAN CORN.

Fourteen varieties of Indian corn were planted for ensilage on May 25. The seed was coated with coal-tar to protect it from crows. The corn was planted in drills and in hills, both 36 inches apart. The drills were thinned to one stalk every ten inches and the hills to three stalks in a hill. The land was clover sod and the corn made a strong, leafy growth but, owing to the coldness of the season, only one variety, the Davidson, matured ears to the glazing stage, while several did not form ears. The varieties were all harvested October 14 and 15.

The yields per acre were estimated from the product of two rows, each 66 feet long.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Character of Growth.	Height.	When Tasseled.		In Silk.		Condition when Cut Oct. 14.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
			Inch.						Tons.	Lbs.	Tons.	Lbs.
1	Superior Fodder......	Very Strong.	116	Aug.	14	Sept.	14	Ears formed..	22	1,980	24	860
2	Wood's Northern Dent.	" "	126	"	20	"	23	" "	22	1,760	24	730
3	Salzer's All Gold.....	" "	120	"	30	"	28	" forming..	22	1,100	20	1,910
4	White Cap Yellow Dent	" "	124	"	19	"	20	" formed...	22	220	17	1,970
5	Comptons Early......	" "	116	"	13	"	7	Early Milk....	21	240	22	220
6	Longfellow....	" "	116	"	14	"	9	" "	21	20	22	110
7	Angel of Midnight....	" "	107	"	11	"	13	" "	20	1,140	17	320
8	Early Mastodon.......	" "	123	"	30	"	27	Ears forming.	18	1,730	17	1,420
9	Mammoth Cuban......	" "	118	"	30	"	30	" "	18	1,620	21	1,670
10	Champion White Pearl	" "	104	"	4	"	7	Late Milk....	17	1,640	18	1,180
11	North Dakota White..	" "	105	"	18	"	22	Early Milk....	17	700	18	190
12	Eureka................	Strong........	120	"	31			In Silk........	17	540	20	1,360
13	Davidson..............	Medium.....	86	"	1	"	4	Glazed... ..	16	560	16	1,220
14	Selected Leaming......	Strong........	110	"	20	"	28	Early Milk...	15	1,570	16	450

Indian Corn—Sown at Different Distances Between Rows.

The same varieties were used as in previous years, Longfellow, Champion White Pearl and Selected Leaming. The plots were sown alongside of, and under the same conditions of soil and cultivation as the other test plots.

As in previous tests, the closely-planted plots gave the heaviest yields, but the corn was very immature and unfit for ensilage. The plots sown at three feet apart were more mature, the ears larger and better developed than in the plots sown closer together, and a better yield was obtained than in the plots sown 42 inches between rows. There is a distinct loss in yield in the test at 42 inches apart, and no gain in development over the plot planted at 35 inches apart.

All the plots were planted May 25 and cut October 14 and 15. The yield per acre is estimated from the yield of two rows, each 66 feet long.

INDIAN CORN—Sown at Different Distances Apart.

Name of Variety.	Distance Apart.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
	Inches.	Tons.	Lbs.	Tons.	Lbs.
Longfellow	21	19	1,977	21	428
"	28	16	670	16	1,660
"	35	17	395	16	926
"	42	15	503	14	191
Champion White Pearl	21	19	1,600	17	1,074
" "	28	16	528	17	933
" "	35	16	135	14	964
" "	42	15	643	11	540
Selected Leaming	21	18	1,337	17	1,074
"	28	17	1,216	16	1,520
"	35	16	1,718	16	359
"	42	14	945	15	423

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown in this test in 1909. The land, a sandy loam, had produced a crop of clover in 1908, which had been top-dressed with stable manure. The land was ploughed after the first crop of clover was removed and rolled and harrowed, the latter operation being repeated several times during the autumn to destroy the sprouted weed seeds, and was in fine condition when the first sowing was made May 8, a second sowing being made May 22.

The drills were 24 inches apart and the plants were thinned to ten or twelve inches apart in the row. The roots were solid and well shaped. The yield per acre in each case was estimated from the product of two rows, each 66 feet long. All were pulled October 30 and November 1.

There was more moisture in the soil when the first sowing was made, which probably resulted in quicker germination, a more even stand and a heavier yield in most cases for the earlier sowing.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Perfection Swede	43	460	1,441		34	300	1,138	20
2	Carter's Elephant	42	1,635	1,427	15	32	1,775	1,086	15
3	Mammoth Clyde	42	480	1,408		38	1,860	1,331	
4	Halewood's Bronze Top	41	1,985	1,398	5	34	1,300	1,138	20
5	Hartley's Bronze	41	1,820	1,347		42	810	1,413	30
6	Good Luck	41	1,160	1,386		37	1,240	1,254	
7	Hall's Westbury	41	830	1,380	30	38	1,880	1,298	
8	Bangholm Selected	40	420	1,340		33	1,970	1,132	50
9	Jumbo	37	1,450	1,256	45	33	1,140	1,119	
10	Kangaroo	36	1,930	1,232	10	25	1,665	869	45
11	Magnum Bonum	35	1,280	1,188		28	100	935	
12	Skirving's	34	1,940	1,166		38	1,800	1,298	

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown in the uniform test plots in 1909. Two sowings of each variety were made, the first on May 8 and the second on May 22, in drills 24 inches apart, and the plants thinned out to about ten inches apart in the drills. All were harvested October 28 and 29.

The roots were very smooth and even in size and the yield was heavier than in the two previous years, as the land, a sandy loam, had been manured the previous season and had been well prepared before sowing.

The yield per acre was calculated from the product of two rows, each 66 feet long.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		First Plot.				Second Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush	Lbs.
1	Perfection Mammoth Long Red..........	38	1,220	1,287		34	640	1,144	
2	Mammoth Red Intermediate.............	35	1,280	1,188		33	990	1,116	30
3	Giant Intermediate	33	1,320	1,122		30	520	1,008	40
4	Selected Yellow Globe........	33	660	1,111		30	1,380	1,023	
5	Yellow Intermediate	31	1,690	1,061	30	35	1,280	1,188	
6	Prize Mammoth Long Red	30	720	1,012		24	1,005	816	45
7	Gate Post	26	965	882	35	25	1,480	858	
8	Crimson Champion......................	26	800	880		25	160	836	
9	Half Sugar White.......................	25	1,810	863	20	24	180	803	
10	Giant Yellow Globe....................	25	1,480	858		39	1200	1,350	

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were grown in the test plots this year. The seed was sown in drills two feet apart, and the plants were thinned out to about six inches apart in the row. The first sowing was made on May 8 and a second on May 22. All were harvested on November 4.

The soil was a warm sandy loam on which clover had been grown the previous year, the second growth being ploughed under.

The yield, which was much better than that of 1908, has been calculated from the product of two rows, each 66 feet long.

The shorter varieties were found to be the better, as they are good croppers and are easier to harvest. The White Belgian is more liable to break and then does not keep so well.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		First Plot.				Second Plot.			
		Tons	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White..................	37	250	1,237	30	36	280	1,204	40
2	White Vosges...........	34	640	1,144		31	865	1,017	45
3	Ontario Champion, ...	34	475	1,141	15	22	880	748	
4	Mammoth White Intermediate.	29	1,070	948	30	23	1,520	792	
5	White Belgian......	28	265	937	45	28	1,420	957	
6	Half-Long Chantenay	26	140	869		27	120	902	

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were grown on sandy loam in 1909. Two sowings of each variety were made, the first on May 8 and the second on May 22, in drills two feet apart, the plants being thinned out to about 6 or 8 inches apart in the row. All were pulled October 29.

The seed germinated very slowly, and the stand was uneven. The yield per acre was calculated from the product of two rows, each 66 feet long.

Specimens of the roots were sent to the Chemist of the Experimental Farms, Mr. Shutt, for analysis of sugar-content. The result is included in the following table:—

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.	Sugar in Juice. p.c.	Solids in Juice. p.c.	Co-efficient of Purity.
1	Vilmorin's Improved.	15	525	508	45	14	1,709	495	..	18·28	19·63	93·1
2	Klein Wanzleben	15	360	506		15	20	500	20	17·80	19·43	91·6
3	French Very Rich .. .	10	1,780	363	9	9	480	308	..	18·83	28·89	90·1

EXPERIMENTS WITH POTATOES.

Eighteen varieties of potatoes were planted on May 3 on sandy loam in the variety test. The land had been in Indian corn the previous year and in clover in 1907.

The seed was cut to two strong eyes per set and planted in drills 30 inches apart, the sets being about one foot apart in the drills. Owing to the dryness of the ground, the seed germinated very unevenly, and continued drought resulted in an uneven stand and poor growth.

All varieties were dug October 12 and 13. The yield, while low, owing to the unfavourable season, was good in quality and even in size. There was no rot in any of the plots. The yield per acre was estimated from the product of two rows, each 66 feet long.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre. Bush.	lbs.	Yield per Acre of Marketable. Bush.	lbs.	Yield per Acre of Unmarketable. Bush.	lbs.	Form and Colour.
1	State of Maine....	367	24	252		125	24	Round white.
2	Dalmeny Beauty...............	356	24	241	00	105	24	Oblong white.
3	Holborn Abundance	356	..	303		52		Round white.
4	Gold Coin...........	343	12	259	12	84		Oval white.
5	Carman No. 1..................	310	12	239		81	12	Round white.
6	American Wonder......	290	24	200		90	24	Long round white.
7	Rochester Rose.....	288	12	228		60	12	Long rose.
8	Money Maker	283	48	243		40	48	Long white.
9	Dreer's Standard........	268	24	214	24	54		Round white.
10	Irish Cobbler..........	257	12	181		76	12	" "
11	Dooley......	250	48	214	12	36	36	" "
12	Morgan Seedling................	211	12	157	12	54		Long pink.
13	Everett.....	200	12	125	12	75		Long reddish.
14	Late Puritan	196	20	147		49	20	Long white.
15	Empire State....................	187	..	142		45		" "
16	Ashleaf Kidney.....	184	48	129	48	55		Oblong "
17	Reeves' Rose..................	182	..	131		51		" rose.
18	Uncle Gideon's Quick Lunch	151	48	129	48	32		Round pale pink.

FODDER PLANTS.

Owing to pressure of other work, the plots of fodder plants were not sown until May 18 and, as the ground was getting dry by that time, the seed germinated slowly and the drought continuing the growth was feeble and the yield was very light. These plots were sown on a clover stubble turned under which had been well prepared with disc and drag and was in good condition.

Plot 1. White Round French Millet.—Stalks 12 to 16 inches long, with very few leaves and short heads. Weight of crop, dried, taken from one-twentieth of an acre, 108 lbs.; at the rate of 1 ton 160 lbs. per acre.

Plot 2. Italian Millet.—Stalks 16 to 18 inches long, weight of cured crop, 123 lbs.; at the rate of 1 ton 460 lbs. per acre.

Plot 3. German Millet.—Stalks 16 to 20 inches long, not leafy and heads from 1½ to 3 inches long. Weight of cured crop, 102 lbs., or 1 ton 40 lbs. per acre.

Plot 4. Pearl Millet.—Stalks 14 to 20 inches long, heads short and poor. Weight of cured crop, 107 lbs.; 1 ton 140 lbs. per acre.

Plot 5. Horse Beans.—Sown in drills 21 inches apart. Cut October 12. The seed germinated very unevenly and the stand was uneven and poor. Length of stalks 9 to 15 inches, and very few pods, which were very short and immature. Weight of crop, 197 lbs.; 3 tons 1,880 lbs. per acre.

Plot 6. Horse Beans.—Sown in drills 28 inches apart. A very uneven stand and crop light. Weight of crop, 119 lbs.; 2 tons 760 lbs. per acre.

SUMMARY OF CROPS.

Hay.—Owing to the very unfavourable winter, during which heavy rains were followed by sharp frosts, a great deal of injury was sustained by the meadows.

The clover especially was seriously damaged, much of it being heaved out. Then the cold, drying winds of March and April prevented growth and, as a consequence, the hay crop was lighter than for years past. As the dry weather continued after the first crop was harvested, the second growth was also poor.

HAY.

	Tons.	Lbs.	Tons.	Lbs.
First crop..	26	1,600		
Second crop..	10	1,200		
Total..	—	——	37	800
Corn in silo..			96	...
Mixed grains cut for hay..			5	480

ROOTS.

	Tons.	Lbs.		
Mangels..	9	650		
Turnips..	41	1,200		
Carrots..	8	630		
Total..	—	——	59	480

GRAIN.

	Bush.	Lbs.	Tons.	Lbs.
Spring wheat	32	18	..	1,938
Mixed oats and wheat	..	..	1	980
Oats	174	12	2	1,928
Barley	22	44	..	1,100
Peas	110	..	3	1,600
Mixed oats and peas	...	..	16	472
Total			26	18

GARDEN VEGETABLES.

The cold, dry weather of the spring prevented a free germination of the seeds of the more tender varieties of garden vegetables and flowers, and a poor stand in many instances followed. As a result of continued unfavourable weather, the quality of most varieties of table vegetables was not very good.

Table Beets.

Two varieties of table beets were sown, the Extra Early Egyptian Blood Turnip and Nutting's Dwarf Improved. The Early Egyptian reached two inches in diameter by July 14, and the Nutting's Improved the same size by the last of the month. Both are of first rate flavour and quality, when grown under favourable conditions.

Table Turnips—Sown April 7.

Extra Early White Milan was the only table turnip sown this year. This variety is very early, of superior quality for table, and if sown in succession, may be had in first-class condition throughout the season. It grows very rapidly and a small plot sown near the stable furnishes a very acceptable addition to the fare of working horses or of any animal which is on dry feed.

Radish.

Sown April 7, and in succession during the spring and early summer.

Early Scarlet White Tipped.—A smooth root, white and crisp. Fit for table May 15.

Early Scarlet Turnip.—Crisp and sweet. Fit for table May 13.

Olive Scarlet.—Fit for table May 20. A smooth, handsome root, and of very good quality.

Early White Turnip-rooted.—Fit for table May 22. A rapid grower, rather strong and stringy.

French Breakfast.—Sweet, crisp and fine flavoured. Fit for table May 28.

Lettuce—Sown April 8.

Iceberg.—A rapid grower and very fine and crisp in quality. Fit for table May 28.

Simpson's Early Curled.—A fine large-leaved lettuce of very good quality, crisp and juicy. Fit for table May 30.

Hydrangea Paniculata Grandiflora, Agassiz, B.C.

16 p. 504

All the Year Round.—A strong grower, not crisp and a little bitter. Fit for table June 4.

Wheeler's Tom Thumb.—A vigorous grower, of only fair quality. Fit for table June 8.

GARDEN PEAS—Sown April 7 and 8.

Rennie's Extra Early.—Fit for table June 14. Vines 20 to 24 inches long and fairly productive. Pods of medium length and well filled; peas of medium size and of good flavour.

American Wonder.—Fit for table June 18. Vines very dwarf, fairly productive, pods short, peas of good size and of very fine flavour.

Thomas Laxton.—Vines 2½ to 3 feet high and productive; pods long and very well filled; peas large and of very superior flavour. Fit for table June 20.

Horsford's Market Garden.—Vines 3 to 3½ feet long, productive, pods of medium length, well filled, peas medium large and of very superior flavour. First peas fit for table July 10.

Dwarf Telephone.—Fit for table June 20. Vines 16 to 18 inches long and productive. Pods very long and well filled with large peas of very fine flavour and quality.

Rennie's Queen.—Vines 3 feet long and very productive. Pods long and well filled with large, very sweet and delicious peas. Fit for table July 12.

BEANS—Planted April 8.

Extra Early Valentine.—Very productive. Fit for table July 9. Pods of medium length, round, thick, and solid, crisp, tender, of very pleasant flavour.

Six Weeks.—A very strong grower and productive. Pods long, flat, crisp, of fair quality. Very short in season. Fit for table July 11.

Dwarf Emperor of Russia.—Vine a fair grower and fairly productive; pods 2 to 4 inches long; fit for table July 19.

Longfellow.—A vigorous grower and productive. Pods 4 to 6 inches long, straight, round and solid; crisp and of fine quality; fit for table July 19.

Improved Prolific Black Wax.—Vines are strong growers and prolific. Pods 3 to 5 inches long, plump, round, crisp and solid. Fit for table July 21. Of very mild pleasant flavour.

Improved Golden Wax.—Fit for table July 21. Pods long and flat, stringless, and of very fine flavour, remaining fit for use for a long time.

CABBAGE.

The cabbage seed was sown in the open garden in beds, on April 3. The seed did not germinate well and the plants did not make a strong growth. They were transplanted May 25 and 26.

Paris Market.—Fit for table July 23. Heads small, solid, crisp and white; of very good flavour and an even header.

Early Jersey Wakefield.—Fit for table July 27. Heads, solid and crisp; one of the best of the very early varieties.

Sutton's Earliest.—Fit for table July 27. An even, regular header; heads solid, white and of very good quality.

Early Midsummer.—Fit for table August 17. This variety produces only a small per cent of solid heads, the remainder being loose and open; of only fair quality.

Early Winningstadt.—Fit for table early in September. Heads of fair size, pointed, solid, white, and of very good flavour. One of the best second early varieties.

Long Island.—Fit for table early in September. A medium-sized round head; of very good quality. Heads solid, crisp, white and of very fine flavour.

Netted Savoy.—A medium early-heading variety of superior merit. A regular header; heads of medium size; very solid, crisp and white. Fit for table in September.

Savoy Drumhead.—Fit for table late in September, and an excellent keeper. Heads broad, flat, solid and crisp; white, tender and of excellent quality.

Extra Blood Red Dutch.—A very regular, even header, heads medium in size, solid, very deep red, crisp, of fine quality, and a good winter keeper.

Danish Ball Head.—An excellent header. Of medium size, round, very hard, white and crisp; an excellent winter keeper.

Surehead.—A fine regular header, solid and of fair size; crisp and a good winter keeper.

Carrots—Sown April 5.

Early Scarlet Horn.—Short, stump-rooted, grows very rapidly and is full flavoured and sweet when still very small. Fit for table June 11.

Half Long Scarlet Nantes (Improved).—A rapid grower and a fine, smooth, crisp root. Fit for table early in July.

Chantenay.—A rapid grower, and of very good quality as well as a fine cropper. Fit for table early in July.

Half-Long Scarlet Luc.—Fit for table early in July; a fine cropper; crisp and sweet.

Cauliflower.

Sown in a seed bed in the open garden April 3, and the plants set out May 25 and 26. The plants were small as the growth had been very feeble in the beds.

Selected Early Erfurt White.—Fit for table late in July; heads small but very white and sweet.

Early Snowball.—Fit for table early in August. Heads medium large, firm and crisp, white and of fine quality.

Walcheren.—Heads large, white, solid, sweet and of good quality. Fit for table early in September.

Brussels Sprouts.

Sown in seed bed April 3 and transplanted the last of May.

Sutton's Matchless Dwarf Improved.—Stalks medium short but very closely set with large sprouts of very delicate flavour. A good keeping variety.

Improved Half Dwarf.—A strong growing variety and very well furnished with solid sprouts of excellent quality. Fit for table early in September, and an excellent winter variety.

New Giant.—A strong, tall-growing variety, thickly set with solid sprouts of good size, and of very mild, pleasant flavour. A good winter sort.

Brocoli.

Seed sown in open beds April 3 and transplanted the last of May.

Superb Early White.—Fit for the table by the last of August. Heads of fine size solid, very white and crisp, sweet and of delicate flavour.

Extra Early White.—Fit for table late in August. Heads of medium size, crisp, firm, white; a good quality, remaining so for a long time.

Sutton's Main Crop.—Fit for table in September. Heads large, white and of good flavour, keeping fit for use for a long time.

Table Corn.

Planted in hills three feet apart each way, four stalks being left in each hill of the small growing sorts and three stalks of the taller growing varieties.

Golden Bantam.—Planted May 12 and fit for table July 28. Stalks 3 to 4 feet in height and producing three to four ears each; ears 4 to 6 inches long and filled out to the end with deep kernels of the finest flavour.

Premo.—Planted May 12. Fit for table August 4. Stalks 4 to 6 feet in height and frequently producing two ears each. Ears 5 to 7 inches long and filled to the tip; corn very sweet and tender.

Early Fordhook.—Stalks 5 to 7 feet in height and often producing two large well-filled ears per stalk. A superior corn, very sweet and tender. Fit for table August 6, remaining so for a long time.

Seymour's Sweet Orange.—Fit for table by the middle of August. Stalks 6 to 7 feet in height; often two fine ears, 5 to 8 inches long on a stalk; corn very sweet and of good flavour.

Ringleader.—Fit for table by the middle of August. Stalks strong and from 6 to 7 feet high. Ears large and well filled with deep grains of very fine quality.

Malakoff.—Fit for table in August. Stalks 5 to 6 feet in height, producing large, well-filled ears of very sweet, delicious corn, which remains in good table condition until late in September.

Early White Cory.—Fit for table in August. Stalks 3 to 4½ feet high, often producing two fine, well-filled ears of sweet, delicious corn.

Onions—Sown March 25.

Sown in drills 18 inches apart. As the spring was so cold and dry, the drought continuing during the early summer, the onions did not develop well and were later in maturing and smaller than usual.

Large Red Wethersfield.—Below medium size, solid and mild flavoured.

Trebon's Large Yellow.—Onions fairly large, but many go to necks and do not ripen.

Extra Early Red. Onions small but ripen early, forming solid bulbs of mild, sweet flavour.

Southport White Globe.—Bulbs of medium size and solid, ripening well and producing a large proportion of well-ripened onions, of mild, sweet flavour.

Large Yellow Globe Danvers.—Bulbs of medium size, very solid and very few unripe; mild, sweet and good in quality.

Australian Brown.—Bulbs of small, medium size, firm, solid and good, ripening early, with a large per cent of well-formed bulbs. A very good sort

PUMPKINS—Planted May 10.

The following varieties were planted in hills ten feet apart each way and three strong p'ants were left in each hill.

Large Field.—Vines very strong growers and productive of deep-fleshed and large pumpkins.

Mammoth Tours.—Vines very long, pumpkins very large, rather coarse in flesh but thick-meated and heavy.

Jumbo.—Vines long and pumpkins large. Too coarse for table use but good for stock.

Quaker Pie.—Vines long and quite productive. Fruit of medium size but very heavy; thick-fleshed, fine-grained and of good quality.

Sweet or Sugar.—Vines long and very productive. Fruit small, thick-fleshed, sweet and very fine in quality.

Large Cheese.—Vines vigorous and very productive; very rapid growers. Pumpkins large, handsome, orange skin, with thick, yellowish flesh of fine quality.

SQUASH.

Planted in hills May 11. Thinned to three strong plants in a hill.

White Bush Scalloped.—Hills 6 feet apart. Very productive and of very fine flavour. Fit for table August 17.

Giant Summer Crookneck.—A strong bushy grower and very productive. Fruit large, crookneck, very solid and of very fine quality. Fit for table August 20.

English Vegetable Marrow.—Planted in hills 12 feet apart and plants thinned to three strong plants in a hill. Vines vigorous and productive; fruit 8 to 14 inches long, seven to nine inches in diameter. Flesh thick, fine-grained, of very fine flavour. Fit for table by the last of August.

Orange Custard Marrow.—Vines strong growers and quite productive. Fruit 6 to 14 inches long and 6 to 8 inches in diameter. Skin bright orange; flesh golden yellow, thick, fine-grained and of fine quality. Fit for table early in September and keeps until the beginning of winter.

Mammoth Whale.—Vines very strong growers and productive; squash, large, dark grayish-green in colour; flesh thick, yellowish, a little coarse, of only fair quality for table, but good for feeding to stock.

Delicata.—Vines strong growers and very productive. Fruit small, weighing from 5 to 13 lbs.; skin, orange striped with green; flesh, orange, very thick, fine-grained and sweet; a very superior table squash. Fit for table in October and is a good winter keeper.

Delicious.—Vines strong growers and productive. Skin, green; flesh orange, thick, sweet, fine-grained and with very fine table qualities. A good winter variety.

Hubbard.—Vines vigorous and productive, of very fine quality for the table and one of the best for winter.

CELERY.

Seed of three varieties of celery was sown in a small hot-bed on April 8 and transplanted on June 22. The soil was very dry when the plants were set out and continued so until autumn, hence the growth was slow and the quality of the celery was not up to the standard.

White Plume.—A medium grower and of very fine, crisp, sweet flavour. A good autumn variety.

Rose-ribbed.—A medium vigorous grower; stalks solid, crisp, pleasant in flavour; a very good autumn and early winter sort.

Giant Pascal.—A very strong grower; stalks long, thick, and very crisp. Flavour mild and pleasant. A good winter variety.

APPLES.

The winter of 1908-9 was the severest for fruit trees that we have had for many years. The summer of 1908 had been rather dry and hot during July and August and growth in the fruit trees was at a standstill until September, when we had copious rains. This caused the fruit trees to put on fresh growth, with the result that when the cold weather set in they were still in a growing condition with a great deal of unripened wood and leaves green and full of sap.

The sharp frosts and severe, long-continued winds of winter were very injurious to the trees and many were so enfeebled that they died when spring opened. The rain in the second week in January froze on the twigs and branches until they were covered with a heavy coat of ice and the north wind which followed broke and split many more trees. Those which survived were, in many instances, too feeble to bring their fruit to maturity, and in consequence the crop was very light and below the average in quality.

COMMERCIAL APPLE ORCHARD.

Several trees of some varieties in this orchard died this summer from the effects of the ice and freezing. Of the varieties which fruited in 1908, only Grimes' Golden and King bore fruit this season. Each of these varieties bore a few apples and made a fair growth, but they were the only kinds to come through the severe winter without loss.

The following have been added to the commercial orchard this spring: Belle de Boskoop, Delicious and Rome Beauty.

ORCHARD NO. 4.

All the trees in this orchard made a satisfactory growth this year, and several promising new varieties have been propagated and will be added to it from time to time as they develop. There are thirty-five varieties planted in this orchard now.

PEARS.

The pear trees suffered from the severe weather at the same time as the apple trees, and those varieties which fruited last summer were unable to perfect the fruit sufficiently to bring it up to the standard of former years. Quite a number of trees leaved out in spring but the leaves fell off in the summer and the trees died. Many others made a feeble growth.

COMMERCIAL PEAR ORCHARD.

The plum crop was a light one and the fruit not first-class in any variety. Quite a number of trees were split or broken down by the winter storms and were taken out.

Several others blossomed, set fruit and gave promise of a crop, but in early summer the leaves began to fall off and the fruit dried up before it was full grown. Several of these trees died and have since been taken out.

PLUMS.

Most of the trees in this orchard have made a satisfactory growth, but a few have died from the effects of the previous winter. A few varieties have been sufficiently tested in the experimental orchards to be added to the commercial orchard this spring.

Commercial Plum Orchard.

The plum trees have made a satisfactory growth and a few of them give promise of fruiting this summer.

CHERRIES.

Like the other fruits, the cherry trees were not very productive this season, very few trees having any fruit. The Morello cherry trees were the only ones which fruited.

PEACHES, APRICOTS, NECTARINES.

None of the trees left of these fruits, either on the level land or on the mountain, fruited this year.

MEDLARS.

This fruit appears to do about as well one year as another. It does not bloom until late in May, and is safe from very cold rains or frosts and, as a rule, produces a good crop every year.

MULBERRIES.

Several of the mulberry trees were split and destroyed by the ice and were taken out. The trees remaining had very little fruit, and what there was did not grow to full size or ripen.

PERSIMMONS.

The persimmon trees lived through the trying winter but did not fruit this season.

MOUNTAIN ORCHARDS.

Although the orchards on the mountain have been neglected for some time owing to scarcity of labour, and have been injured by bears climbing and breaking them down to get the fruit, yet the crop of apples and plums was heavier there than on trees of the same age and variety growing on the level bottom land, and the fruit is generally freer from blemishes.

As in previous years, the bears commenced harvesting the plums before they were quite ripe, and continued to look after the fruit until the last of the apples were picked. Owing to the bears' ability as a climber, it is practically impossible to protect small orchards like this, which are surrounded with large areas of timber.

The timber and nut trees planted some years ago on the mountain have grown, and especially where the undergrowth of ferns and native shrubs is at all thin, they have made a fair growth and are becoming recognizable from the valley when the leaves turn in the autumn and, as they rise above the ferns, they will grow faster.

SMALL FRUITS.

The storm of January, 1909, proved very destructive to all small fruits. Blackberry and raspberry canes were broken down to the ground and many were severely injured in their roots. Of the blackberries, the Eldorado alone withstood the cold and ice to some extent and bore a little fruit. There were no raspberries.

The red, white and black currant bushes, although bent with the weight of the ice, were not broken but were considerably injured, although they fruited freely. The fruit, however, was small and of poor quality. Some of the bushes died when the fruit was half grown.

NUT PLANTATION.

Last winter was so severe, following, as it did, an unfavourable summer, that the nut trees did not leaf out till late in the season, the English walnuts not being in leaf till late in May and the chestnuts not until July. None of these had any nuts on last fall, and the black walnuts and the butternuts fruited very sparingly. The Japanese walnuts fruited very well. The shell-bark hickory also fruited but, the trees on this Farm being seedlings, the nuts are very small.

The Japanese walnuts are being more appreciated as the seedling trees from the earlier distribution grow larger and develop. They make a very handsome shade tree and will be useful where a windbreak is needed to protect fruit orchards from autumn winds.

None of the pecan trees have fruited yet. Several of them were killed last winter, and it is doubtful if this tree is of any value in this district.

The crop of filberts was very light, except on Pearson's Early Red. This variety had a fair crop, but it is impossible to protect them from the blue jays, which come from the woods in large numbers and commence to carry off the clusters of nuts long before they are mature.

FOREST PLANTATION.

The eastern forest trees planted in the spring of 1893 have, almost without exception, made a strong, healthy growth. Such varieties as the hickory, walnut, oak, white pine, maple, beech and basswood, have in many instances attained a height of over 30 feet, with a diameter of from 6 to 10 inches at stump height.

HORSES.

The force of horses on the Farm remains the same as at the time of my last annual report, namely, three span of working horses, one of the old horses brought here in 1889, and a young general purpose mare, used as a driver. There has been no accident or sickness among the horses during the past year.

CATTLE.

Since my last report, several bulls have been sold for breeding purposes and a number of the older cows have been fattened and sold to the butcher. We have on hand one very fine bull, got as a calf from the Central Experimental Farm, and two young bulls, eleven cows and heifers of breeding age, and six very fine heifer calves, making a herd of twenty pure-bred Shorthorns. There has been a slackening off in the demand for Shorthorns in this lower country, and several herds have been dispersed in the last three years owing to the increased interest taken in dairying, and bulls of the dairy class have been used instead of those of the beef breeds.

SHEEP.

All of the sheep on the Experimental Farm are pure-bred Dorset Horned, and they seem to be very well adapted to this damp climate. The ewes are excellent

mothers, giving a plentiful supply of milk for their lambs and they are prolific, oftener producing twins than single lambs. The flock consists of seventeen ewes and a ram and nine lambs up to date, one fat ewe and two rams having been sold, and one ewe and three lambs killed last spring by wild animals.

PIGS.

The stock of pigs at present consists of one Berkshire sow and one boar, and of Yorkshires, one boar, three breeding sows and fifteen young pigs of both sexes. Since my last report, twenty pigs have been sold, most of them for breeders, and there is considerable demand at present for young breeding stock, both boars and sows.

POULTRY.

During the past year, the same varieties of fowls have been kept as in the year previous, and with practically the same results.

The fowls have been healthy, except that occasionally one would go lame, as if from rheumatism. Our practice is to kill immediately any ailing fowl, as it is unwise to breed from one which has at any time been ill.

The breeds kept are: Rhode Island Red, Black Minorca, Barred Plymouth Rock, Buff Orpington and White Wyandotte. Of these the Rhode Island Red laid the largest number of eggs during the year with the Black Minorcas a close second. The Buff Orpingtons, Barred Plymouth Rocks and the White Wyandottes are about equal as layers with us. The Rhode Island Reds and White Wyandottes mature the earliest, although they are not as large when mature as are the Buff Orpingtons and Barred Plymouth Rocks.

Each breed is kept in a separate pen from January 1 to July 1. After that they are all at large. While they are in pens, the hens of one pen, each breed in its turn, are at large, giving them their liberty one day in five, when their having so large a range and eating grass and insects of various kinds will be likely to insure a better hatch and stronger chickens.

The fowls are fed mixed grain, wheat, peas, oats and barley; about one-half wheat, one-quarter oats and one-quarter peas or barley.

The little chickens are raised in coops of about 2½ x 3 feet in size, which are placed on board platforms. Once a week, these coops are lifted off the platforms, which are cleaned, fresh chaff or dry earth placed on them and the coops replaced. One advantage in having the board floor is that skunks cannot burrow in under the coop and get to the chickens as they might if the coop were placed on the ground, and besides it is dry, which is an important consideration in this climate. There is a slatted door which is used in the daytime for the first two or three weeks to keep the hen in and let the chickens run in and out and a solid door which is always used at night.

The little chickens are fed, when twenty-four hours' old, bread crumbs mixed with hard-boiled egg. On the third or fourth day there is added to this pin-head oatmeal. Fresh water and grit are always before them. Once or twice a week, they get a little cooked or raw meat cut fine, or sometimes, in place of the meat, they get any kind of good, clean grease or drippings, mixed with the pin-head oatmeal. When the chickens are about three weeks old, we begin to feed some whole wheat and a little cracked corn as well as the pin-head oatmeal, and, on dry days, the hen and her chickens are allowed their liberty, when they can pick up a variety of food themselves.

In winter, all the fowls have a cabbage head or turnip to pick, and besides the small potatoes are boiled and mashed with a little chop of whatever kind we have.

The pens are cleaned once a week, when fresh chaff, three or four inches deep, is put on the floor. The whole of the inside of the building is cleaned several times in the year by spraying with whitewash to which is added a little carbolic acid. The

roosts are frequently washed with sheep dip, keeping the house and fowls almost free from insects.

The yards are frequently limed and dug over. This practice, together with being empty from July to January keeps the yards clean and pure. It is necessary to pay particular attention to this in this climate as we have considerable damp weather, which we find much more trying to the fowls than bright, frosty weather.

There has been a good demand for eggs for hatching and also for any spare birds, both male and female.

BEES.

Last season was too dry, and, as a consequence, nectar was scanty in the flowers, the bees storing but little honey.

There were eleven swarms in the spring and at this date there are nineteen which appear to be fairly strong and are actively at work on fine days.

CLEARING.

About four acres of light clearing has been underbrushed and grubbed, ready to plough, and about two acres ploughed twice and will be cropped this summer. No more ditching has been done, as it was impossible to get sufficient labour to carry on the work of the Farm and keep everything in good condition as one would like to have it. As a result, the mountain orchards have been neglected as the work on the level portion of the Farm was of much more importance.

SAMPLES DISTRIBUTED.

There is very little call in this district for samples of seed barley, field peas or wheat; most of the demand being for oats and potatoes. Following are the samples sent out:—

Spring wheat	17
Seed oats	241
Seed barley	29
Seed peas	47
Seed potatoes (bags, 3 lbs.)	290
	624

There was no Indian corn, fall wheat or rye for distribution this year.

CORRESPONDENCE.

Letters received	4,751
Letters despatched	4,506

METEOROLOGICAL RECORD.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.	
1909.	Day.	Deg.	Day.	Deg.	Inches.	Hours.	Min.
April	30	71	22	29	4·22	158	30
May	2	78	21	30	2·32	168	18
June	13	86	4	38	2·36	200	18
July	12	87	18	41	3·49	206	36
August	19	87	9 & 21	42	3·18	199	24
September	8	88	17	37	6·35	123	18
October	12	68	26	29	5·49	88	24
November	4	61	15	25	20·88	43	42
December	16	47	3	14	2·10	73	54
1910.							
January	31	58	3	22	4·58	44	48
February	16	53	21 & 22	10	5·41	69	00
March	18	72	23	28	5·36	108	36
Total Precipitation					65·84	1,484	48

Total precipitation for year ending March 31, 1909, 44·02 inches.
Total precipitation for year ending March 31, 1908, 55·40 inches.
Total sunshine for 1909, January 1 to December 31, 1,457 hrs. 48 min.

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE,

Superintendent.

INDEX

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR	WM. SAUNDERS, C.M.G., LL.D
DOMINION AGRICULTURIST	J. H. GRISDALE, B. AGR.
" HORTICULTURIST	W. T. MACOUN
" CEREALIST	C. E. SAUNDERS, PH. D.
" CHEMIST	FRANK T. SHUTT, M.A.
" ENTOMOLOGIST	C. GORDON HEWITT, D.SC.
" BOTANIST	H. T. GÜSSOW
POULTRY MANAGER	A. G. GILBERT
SUPT. EXPERIMENTAL STATION, CHARLOTTETOWN, P.E.I.	J. A. CLARK, B.S.A.
" " FARM, NAPPAN, N.S.	R. ROBERTSON
" " STATION, CAP ROUGE, QUE.	GUS. A. LANGELIER
" " FARM, BRANDON, MAN.	JAMES MURRAY, B.S.A.
" " " INDIAN HEAD, SASK.	ANGUS MACKAY
" " STATION, ROSTHERN, SASK.	WM. A. MUNRO, B.A., B.S.A.
" " " LETHBRIDGE, ALTA.	W. H. FAIRFIELD, M.S.
" " " LACOMBE, ALTA.	G. H. HUTTON, B.S.A.
" " FARM, AGASSIZ, B.C.	THOS. A. SHARP

FOR THE

YEAR ENDING MARCH 31

1911

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1911

[No. 16—1912.]

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1911.

SIR,—I beg to submit for your approval the twenty-fourth annual report of the work done and in progress at the several Experimental Farms and Stations.

In addition to my own report, you will find appended, reports from the following Dominion officers of the Central Experimental Farm:—From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Cerealist, Dr. C. E. Saunders; from the Chemist, Mr. Frank T. Shutt; from the Entomologist, Dr. C. Gordon Hewitt; from the Botanist, Mr. H. T. Güssow and also from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms and Stations, there are reports from Mr. J. A. Clark, Superintendent of the Experimental Station for Prince Edward Island at Charlottetown; from Mr. R. Robertson, Superintendent of the Experimental Farm for Nova Scotia at Nappan; from Mr. Gus. A. Langelier, Superintendent of the Experimental Station for Central Quebec at Cap Rouge; from Mr. James Murray, Superintendent of the Experimental Farm for Manitoba at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for Southern Saskatchewan at Indian Head; from Mr. Wm. A. Munro, Superintendent of the Experimental Station for Central Saskatchewan at Rosthern; from Mr. W. H. Fairfield, Superintendent of the Experimental Station for Southern Alberta at Lethbridge; from Mr. G. H. Hutton, Superintendent of the Experimental Station for Central Alberta at Lacombe, and from Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm for British Columbia at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several Experimental Farms and Stations; of scientific research in connection with the breeding of cereals and in determining their relative value;

of research work in the chemical laboratories bearing on many branches of agricultural and horticultural employment; of careful study of the life-histories and habits of injurious and beneficial insects and the best methods to adopt for destroying the most injurious species.

In the report of the work of the Entomological Division will be found particulars of the efforts which are being made to obtain control of the Brown-Tail moth in eastern Canada. The methods of management of the Apiary are also referred to. In this Division, also, the regulations governing the importation of nursery stock into Canada are administered. In the Botanical Division, progress has been made in the investigation of several specific plant diseases, their life history has been studied and practical means for their control suggested. Continued attention has also been given to the subject of noxious weeds and to the most practical and economical methods by which they may be destroyed. To the work of the Cereal Division has been lately added the annual distribution of grain for the improvement of seed.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the Experimental Farms, the rapidly extending correspondence, and the readiness shown by farmers everywhere to co-operate with the work of the Farms in the testing of new and promising varieties of cereals and other farm crops, furnish gratifying evidence of the desire for information among this class of the community, also of the high esteem in which the work of the Farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower, and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,

Director, Dominion Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT OF THE EXPERIMENTAL FARMS

FOR THE YEAR ENDING MARCH 31, 1911

REPORT OF THE DIRECTOR

WM. SAUNDERS, C.M.G., LL.D., F.R.S.C., F.L.S.

The final report of the results of the crops grown in the Dominion of Canada for the season of 1910, as given in the December number of the Census and Statistics Monthly, shows a falling off in some of the provinces, while, in others, a decided increase is recorded. The total area of land under cultivation has increased from 30,065,556 acres to 32,711,062 acres, a net increase of 2,645,406 acres. Notwithstanding this very considerable increase in the area under cultivation, the total value of the crops was less by over twenty-five million dollars than that of the previous year.

This result has been brought about mainly by the reductions in crop in the western provinces, chiefly due to the great drought which prevailed over a large area in the Canadian Northwest during the greater part of the growing season of 1910. The final details show a falling off in production of spring wheat of over seventeen million buhels, in oats of over thirty million and in barley of over ten million bushels.

The eastern provinces enjoyed exceptionally fine weather, the crops there have been bountiful and the quality of the products excellent. These provinces show gains both in wheat and in oats. In wheat, the increase is given as 1,836,600 bushels; in oats 28,669,000 bushels.

In other crops especially important in the east, the returns have been most gratifying. The hay crop will total about 15,291,000 tons, the market value of which, computed at the local prices this year, will be over 147 million dollars. Much of this hay. which is of first quality, will be required for the building up of the stock industry. This excellent fodder material will be supplemented in the provinces east of Manitoba by a large crop of turnips and other field roots of an estimated value of $20,618,000. also by a yield of fodder corn of 2,551,000 tons, valued at $11,957,000. The total value of the hay, field roots and fodder corn is nearly 180 million dollars, being about $17,000,000 in advance of last year. Such substantial returns to the farmers of eastern Canada will provide means for a healthy growth in all branches of agriculture and must prove a stimulus to agricultural progress.

Among the eastern provinces, all of which have shared in the prosperity which a good harvest has brought about, Ontario, with her large area of land under crop, always occupies a position of prominence. While the increase in the total crop of wheat in Ontario in 1910 amounted to 1,543,000 bushels, the yield per acre of spring wheat rose from 17·45 bushels in 1909 to 20·19 in 1910; winter wheat from 24·24 to 25·24 bushels per acre, while the increase in the oat crop in 1910 was 19,725,000 bushels, with an average yield per acre of 39·40 bushels, as compared with 34·75 bushels in 1909. There was a slight decrease in the total crop of barley of 225,000 bushels, due to a smaller acreage being sown, the average yield per acre, 29·75 bushels, being slightly greater than that of the previous year, 29·04. Of corn for husking, which is

grown mainly in Essex, Lambton, Kent and Elgin, and which covered an area in 1910 of 229,040 acres, there was produced 17,853,000 bushels. The yield per acre increased from 59.61 to 59.7 bushels. The increase in the production of hay in Ontario is perhaps the most important item we have yet enumerated, amounting in all to 1,976,000 tons, with an estimated value of $8,197,000.

The following table gives the yields of the principal cereal crops in each province in the Dominion for 1909 and 1910:—

EASTERN PROVINCES.

—	Yield per Acre, 1909.	Total Yield, 1909.	Yield per Acre, 1910.	Total Yield, 1910.
	Bush.	Bush.	Bush.	Bush.
Prince Edward Island:—				
Spring Wheat	20·00	522,000	20·52	615,600
Oats	33·70	6,201,000	36·48	6,778,000
Barley	27·61	169,000	28·00	159,600
Nova Scotia—				
Spring Wheat	19·80	404,000	22·85	480,000
Oats	31·56	4,358,000	39·52	5,723,000
Barley	24·77	221,000	30·33	264,000
New Brunswick—				
Spring Wheat	20·15	395,000	19·03	371,000
Oats	27·87	5,775,000	29·69	6,351,000
Barley	29·26	94,000	35·29	73,000
Quebec—				
Spring Wheat	16·71	1,679,000	18·38	1,827,000
Oats	27·00	42,501,000	29·66	48,927,000
Barley	24·02	2,604,000	24·49	2,547,000
Ontario—				
Spring Wheat	17·45	2,176,000	20·19	2,429,000
Winter "	24·24	14,086,000	25·24	15,376,000
Oats	34·75	109,192,000	39·40	128,917,000
Barley	29·04	20,952,000	29·75	20,727,000

Total grain yield, Ontario and Eastern provinces, in 1910, spring wheat, 5,722,600 bushels; winter wheat, 15,376,600 bushels; coarse grains, oats and barley, 220,466,600 bushels.

WESTERN PROVINCES (omitting British Columbia).

—	Yield per Acre, 1909.	Total Yield, 1909.	Yield per Acre, 1910.	Total Yield, 1910.
	Bush.	Bush.	Bush.	Bush.
Manitoba—				
Spring Wheat	18·77	52,706,000	13·65	41,159,000
Oats	39·76	55,267,000	28·76	41,742,000
Barley	29·98	20,866,000	20·21	13,826,000
Saskatchewan—				
Spring Wheat	23·13	85,197,000	16·73	81,139,000
Oats	49·70	91,796,000	31·10	61,367,000
Barley	33·28	4,493,000	26·18	3,598,000
Alberta—				
Winter Wheat	24·80	2,009,000	12·59	1,234,000
Spring "	24·90	7,570,000	12·32	5,359,000
Oats	46·80	38,376,000	24·27	23,644,000
Barley	32·25	5,999,000	20·32	3,953,000

Total grain yield west of Ontario (omitting British Columbia) in 1910: Spring wheat, 127,657,000 bushels; winter wheat, 1,234,000 bushels; coarse grains, oats and barley, 148,130,000 bushels.

RESULTS OBTAINED ON TRIAL PLOTS OF GRAIN ON EXPERIMENTAL FARMS.

It may be interesting here to compare the crops which were realized during 1910 on the trial plots of grain on the Experimental Farms in the several provinces of the Dominion, showing the results obtained under good treatment of the land.

In giving these results, it should be borne in mind that they are from plots varying from one-tenth to one-sixtieth of an acre, and such plots usually give greater returns than are obtained in field lots.

Central Experimental Farm.

	Per Acre. Bush.	Per Acre. Lbs.
Spring wheat—Average yield of 16 varieties..	35	48
Oats " " 24 " ..	68	8
Barley, 6 row " " 11 " ..	65	38
Barley, 2 row " " 10 " ..	45	47

Experimental Station, Charlottetown, P.E.I.

	Per Acre. Bush.	Per Acre. Lbs.
Spring wheat—Average yield of 13 varieties..	39	19
Oats " " 21 " ..	121	29
Barley, 6 row " " 11 " ..	65	38
Barley, 2 row " " 10 " ..	62	19

Experimental Farm, Brandon, Man.

	Per Acre. Bush.	Per Acre. Lbs.
Spring wheat—Average of 8 varieties..	35	14
Oats " " 16 " ..	83	3
Barley, 6 row " " 10 " ..	43	29
Barley, 2 row " " 9 " ..	52	12

Experimental Farm, Indian Head, Sask.

	Per Acre. Bush.	Per Acre. Lbs.
Spring wheat—Average of 7 varieties..	50	14
Oats " " 16 " ..	77	..
Barley, 6 row " " 10 " ..	62	2
Barley, 2-row " " 9 " ..	59	25

Experimental Station, Lethbridge, Alta. (non-irrigated).

At this Station, the crops suffered very much from drought.

	Per Acre. Bush.	Per Acre. Lbs.
Winter wheat—Average of 9 varieties..	11	3
Spring wheat " " 12 " ..	11	..
Oats " " 16 " ..	21	13
Barley, 6 row " " 10 " ..	9	12
Barley, 2 row " " 9 " ..	10	13

On the irrigated part of the land, where water was applied, the yields were larger, but the irrigated land this year had not all the advantages it should have had, for the

reason that the water was not available until some time in June, owing to the ditches being under repair, and, as the spring was exceedingly dry, an earlier watering of these crops would have been very beneficial.

Experimental Station, Lethbridge, Alta. (irrigated).

	Per Acre. Bush.	Lbs.
Spring wheat—Average of 4 varieties..........	25	52
Oats " " 5 "	71	10
Barley, 6 row " " 4 "	33	36
Barley, 2 row " " 2 "	48	26

The season of 1910 was so very exceptional in respect of drought that it is not to be wondered at that the crops were small. No such season has been experienced in the memory of the oldest inhabitants in that part of Alberta, and it is hoped it may not occur again in our time. Still, the average of eleven bushels per acre on 'dry farming' land is not bad, considering the averages that were got in those drier states which border on Canada where most of the yields were less.

Experimental Station, Lacombe, Alta.

At the Experimental Station at Lacombe, there were unusually large returns this year. Those of spring wheat are most remarkable, but are strictly accurate.

	Per Acre. Bush.	Lbs.
Spring wheat—Average of 10 varieties..........	63	7
Oats " " 17 "	74	24
Barley, 6 row " " 10 "	69	34
Barley, 2 row " " 9 "	60	18

Experimental Farm, Agassiz, B.C.

	Per acre. Bush.	Lbs.
Spring wheat—Average of 9 varieties..........	26	51
Oats " " 17 "	72	23
Barley, 6 row " " 10 "	39	2
Barley, 2 row " " 9 "	43	14

The details herewith submitted show that the average returns from the plots of grain on the several Experimental Farms are a long way in advance of the average yields obtained by the farmers of the several provinces. There is no doubt that these latter will materially increase as the farmers gain a better knowledge of successful crop-growing.

YIELDS OF PRINCIPAL GRAIN CROPS IN THE UNITED STATES FOR THE YEARS 1909 AND 1910.

The following table gives some of the details of the yields of the principal grain crops in the United States for the seasons of 1910 and 1909, taken from the 'Crop Reporter,' the official organ of the United States' Department of Agriculture. The average yield per acre of the entire wheat crop of that country is given, also that of several of the States individually, namely, North Dakota, South Dakota, Kansas, Minnesota and Nebraska, where the yields, owing to somewhat similar climatic conditions, are to a certain extent comparable with those of the Canadian Northwest.

—	Yield per Acre, 1910.	Yield per Acre, 1909.	Average Yield for Ten Years.
	Bush.	Bush.	Bush.
Oats—			
United States, entire crop	31·0	31·9	29·5
North Dakota	7·5	32·0	29·7
South Dakota	23·4	30·0	31·6
Minnesota	28·7	33·0	31·7
Nebraska	28·0	25·0	26·4
Kansas	33·0	22·0	24·4
Barley—			
United States, entire crop	22·4	24·3	25·7
North Dakota	5·7	21·0	23·0
South Dakota	18·2	19·5	25·3
Minnesota	21·9	23·6	25·7
Nebraska	18·5	22·0	24·0
Kansas	18·0	18·0	19·8
Spring Wheat—			
United States, entire crop	11·8	15·8	13·7
North Dakota	5·5	10·7	12·1
South Dakota	12·8	14·1	12·1
Minnesota	16·0	16·8	13·0
Nebraska	13·9	14·0	13·0
Kansas	8·4	11·5	11·8

This instructive summary shows that, as far as crops are concerned, the farmers of Canada have not very much cause for complaint.

NEW EXPERIMENTAL STATIONS.

SCOTT, SASKATCHEWAN.

During the past year, the site for a new Experimental Station has been chosen for northern Saskatchewan. This has been located on the line of the Grand Trunk Pacific Railway, a short distance from the town of Scott, on the opposite side of the railway track and fronting on the railway for about half a mile. The town was started in 1909, and in April, 1910, was said to have a population of about five hundred. Mr. Duncan Anderson selected this site and it was subsequently visited and approved by the Director and other officers of the Farms. Mr. Anderson, who has resided at Scott during the greater part of the past year, has supervised the breaking and preparation of the land, has prepared plans of the buildings and superintended their erection and has written that report of the work which has been accomplished under his careful supervision which appears on a subsequent page.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC.

A farm of 380 arpents (about 320 acres) has been chosen for this purpose at Cap Rouge, about ten miles from the City of Quebec. This property, known as the Stadacona Farm, is situated a short distance west of Cap Rouge.

Mr. J. H. Grisdale, Dominion Agriculturist, who carefully examined the property and reported on it, says: 'Stadacona Farm, the property of Mr. Gus. A. Langelier, is situated on the high land just west of Cap Rouge village. It fronts on the main road leading to Quebec from the northern tier of counties of the province. It commands an extensive view of the St. Lawrence River and is prominently in view from that river. It lies at the crossing of the Transcontinental and Great Northern railways and is plainly in view from either road. It is crossed at the rear or north end by the Transcontinental and the Great Northern passes within two hundred yards of

the southern end. The station on the Great Northern is situated about six hundred yards from the farm buildings; no stations are yet located on this part of the Transcontinental line.

'This property lies about ten miles from the City Hall, Quebec. The soil is a clay loam, for the most part It is underlaid at various depths with shale. It has been, in a large measure, underdrained. The soil is not, however, apparently very fertile. The farm is well fenced and nicely laid out in fields. The buildings, with the possible exception of the horse-barn, are quite such as would be required on an Experimental Station and will probably be sufficiently commodious for years to come.

'Of the 380 arpents comprising the farm, about 225 have been brought under cultivation, and about fifty arpents more could, with moderate expenditure, be brought under the plough. This large area would permit of work of all kinds being satisfactorily carried on, as, for instance, horse-breeding, sheep-breeding and pork production, as well as dairying, crop-production, variety tests and horticultural work. The soil would probably not be very suitable for apple production, but would suit most other fruits and vegetables.'

Subsequently, this farm was purchased, and Mr. Gus. Langelier was appointed as Superintendent, dating from January 1, 1911.

The new Superintendent has prepared a brief report, which will be found following that of the Superintendent of the Nova Scotia Farm.

EXPERIMENTAL STATION AT STE. ANNE DE LA POCATIÉRE.

This site was examined by the Hon. Sydney Fisher, in company with Mr. J. H. Grisdale, accompanied by several residents of the district who were interested in agriculture. Mr. Grisdale reported on this farm as follows: 'This farm is composed of two holdings, one of eighty-four arpents occupied by Mr. Antonio Gendron and a part of that occupied by Mr. Georges Hudon, about sixty arpents, making 144 arpents, or about 120 acres, in all.

'These properties lie immediately west of the station on the Intercolonial Railway. They are traversed from east to west by the main travelled road of the counties of Kamouraska and L'Islet. A much-used road to the southward starts on the west side of the Gendron property.

'These farms consist each of a stretch of level land extending south from the Intercolonial Railway for about 1,100 yards to the foot of a hill, from which point they rise for another 1,000 yards or thereabouts. The level part of the land consists of heavy clay soil, possible of drainage, which would be needed. The upper or rising land consists of porous, gravelly soil, in some parts covered, to a greater or lesser extent, with boulders. The hill land is, in part, arable, or capable of being made so. The lots are each about 120 yards wide. The land would be very suitable for experimental work, as it is quite typical, in character and situation, of the land of this district.'

This property was subsequently purchased, but no work has yet been done on the place.

EXPERIMENTAL STATION AT KENTVILLE, N.S.

A site comprising about 240 acres in all has been chosen at Kentville, N.S. On this Station, fruit-growing is expected to hold a prominent place. While the Department has only recently taken possession of this property, some preparatory work has already been done, including the brushing of a few acres and some breaking.

EXPERIMENTAL STATION AT INVERMERE, B.C.

This land, which has recently been acquired by the department in the Invermere district, consists of about thirty-five acres in all, adjacent to the Invermere townsite.

No work has yet been done in connection with this Station. Here, also, it is expected that the experimental work will consist mainly of tests of varieties of fruits to ascertain those suitable for the district.

EXPERIMENTAL STATION FOR NORTHERN SASKATCHEWAN.

Report of Mr. Duncan Anderson on the work which has been done at Scott, Saskatchewan, during the past fiscal year.

SCOTT, SASK., March 31, 1911.

'Dr. WM. SAUNDERS, C.M.G.,
'Director, Dominion Experimental Farms,
'Ottawa.

'SIR,—This farm is situated on the main line of the Grand Trunk Pacific Railway, close to the town of Scott. The town has a population of about 600, and is 103 miles west of Saskatoon, and 223 miles east of Edmonton. Scott is the centre of a large area of splendid grain-growing country. The famous Tramping Lake region lies directly south and the well-known Cut-Knife section to the north and west.

The Farm.

'The farm consists of 198½ acres and is bounded on the east by the main travelled road leading into the well-settled Tramping Lake District, on the north by the railway and on the south and west by division lines. The surface of the farm is undulating, open prairie, unbroken by either brush or sloughs. One or two small pot-holes and here and there a few stones can be seen.

The Soil.

'The soil is a chocolate-coloured clay loam, of very uniform quality, from twelve to fifteen inches deep, underlaid with a clay subsoil. With the exception of an acre in the north-east corner, which had been ploughed by a homesteader, the farm was in a primitive condition.

'Farming operations were begun on this property on the 16th of May, when drilling for a well was started and in a few days an abundant supply of water was obtained at a depth of sixty-five feet. The flow of the spring is five barrels per hour. The well is situated twenty feet from the south-west corner of the house.

Breaking.

'Between May 25 and June 7, one hundred and five acres were broken; seventy-three acres of this were backset and the balance, thirty-two acres, was broken deeply and surface-worked. All the breaking was packed directly after the ploughs and thus considerable moisture from the June rains was stored in the soil.

Breaking and Backsetting.

'On seventy-three acres, breaking was done shallow, from two and a half to three inches deep, well packed, and left till after harvest, when it was backset five inches

deep, single-disced and double-harrowed. As all team work was done by contract, it is easy to get at the cost per acre:—

Breaking	$3 75
Packing	0 25
Backsetting	3 75
Single discing	0 50
Double harrowing	0 50
Total cost	$8 75

'The backsetting will require some cultivation in the spring to work up a good seed bed.

Deep Breaking.

'Thirty-two acres were broken, about four and a half inches deep, packed, and left until the middle of July, when it was double-disced and double-harrowed. Again in October it was double-disced and double-harrowed, and cost as follows, per acre:—

Breaking	$3 75
Packing	0 25
July—Double-disced	1 00
Double-harrowed	0 50
October—Double-disced	1 00
Double-harrowed	0 50
	$7 00

'The surface-worked, deep breaking is in fine tilth and in good condition for the seed.

'In both deep breaking and backsetting, the sod was thoroughly decayed, showing the beneficial results of breaking and packing early in the season.

Fencing.

'In the month of August, the farm was enclosed with a substantial wire fence. Cedar posts not less than six inches at the small end were set twenty feet apart and three feet in the ground. All corner and anchor posts were planted four feet deep and firmly braced and on these was stretched woven wire four feet high and securely stapled to the posts. A strand of barbed wire was extended six inches above the woven wire and all the posts sawn off two inches above the barbed wire, with the woven wire raised three to four inches from the ground. This makes the fence about five feet high. A double gate sixteen feet wide gives access to the barn and stable and a single ten-foot gate and a small four-foot gate give entrance to the house.

'To ensure a straight line of posts, the following method was adopted—

'A stout wooden peg was driven every two hundred yards on a surveyed line. A wire was tightly stretched along these so as not to blow with the wind, and every twenty feet along it a small wooden pin was driven to mark the place for a post. These pins were driven close to the wire. A piece of tin, nine inches in diameter, cut round, with a hole in the centre, was prepared. The pin marking the place for a post was pulled out, the tin placed over the hole thus made and a small iron pin was driven into the ground through the hole in the tin into the same place that the wooden pin was in. With a sharp spade, the sod was cut three inches deep around the tin; when this round piece of sod was lifted out, it marked the exact place where a post was to be set. Care was exercised in placing the posts, to have the straightest side turned to the wire. This easy method of laying out post holes gives an exactly straight fence-line.

Buildings.

'A house and a barn are in course of erection and will be ready for occupancy in the spring.

House.

'The Superintendent's house in outside measurement is 30 feet by 32 feet. The summer kitchen is 14 feet by 14 feet. The basement is the full size of the house and the summer kitchen, and is divided into three parts, in one of which a furnace has been installed, also a coal bin and a soft water tank. The second is for vegetables, potatoes, fruits, etc., and the third provides an outside entrance to the cellar. The ground floor has four rooms, parlour, dining room, kitchen and office. There are four good-sized bed-rooms and a bath upstairs, and a commodious attic. A spacious verandah, eight feet wide, extends along the east and north sides of the house. A small balcony on the north side overlooks the railway and a vestibule protects the main entrance on the east side. The house is substantially built of good material.

The Water Supply.

'This is obtained from the well and is forced up into a tank in the attic. A sixty-barrel galvanized tank has been placed in the cellar, to receive the rainfall and will furnish a sufficient supply of soft water for household use.

Sewerage.

'A septic tank 10 feet by 6 feet and 8 feet deep has been built of concrete cement with a reinforced concrete roof. The tank is situated forty-five feet from the house. The outlet from the tank is a four-inch glazed tile drain, well connected at the joints, which empties into a large disposal pit which is filled in with loose stones and covered over with earth so as not to interfere with the plough. From the septic tank to the disposal pit is 225 feet.

'The aim in planning these buildings has been to have them as convenient as possible and to utilize all space, also to secure a plentiful supply of hard and of soft water and to have the best sanitary conditions possible surrounding a rural home.

Barn and Stable.

'The combined barn and stable is 62 feet by 38 feet with twenty-foot posts and a hip roof. This gives a large, roomy barn with plenty of space for storing hay and fodder.

Horse Stable.

'The stable is in the east end of the building and has accommodation for nine horses; six single stalls, one double stall and a loose feed box, also a five-foot passage, in which the hay hatch, oat, bran and crushed-grain bins are conveniently arranged. A large bin for oats with a capacity of two thousand bushels has been provided in a corner of the barn and a chute conveys the grain to a smaller bin in the feed passage. The floors are laid in concrete. The stalls are planked on top of the concrete, except the loose box, which has a clay floor.

'The water supply is obtained from the tank in the house attic. A pipe line connects the stable with the house, with a hydrant standing in the feed passage. From a small tank at the hydrant, water will be siphoned into a watering trough in the yard.

'A large, air-tight, ventilating shaft connects the stable ceiling with the cupola on the roof; this will carry off the impure air from the stable. Four cold air inlets, two on each side of the stable, provided with shut-offs, will cause a circulation of pure air.

'The west of the lower part of the barn will be used to keep wagons, sleighs, implements, etc., in. A driveway twelve feet wide, with roller doors on each side, divides the stable from the wagon house. The barn, like the house, is constructed of good material. The foundation is of concrete cement fourteen inches thick, goes down three feet into the ground and rests on two foot wide footings. The barn is securely anchored into the foundations with twenty iron rods three and a half feet long. The height of the foundation above the ground level is about eighteen inches.

I have the honour to be, sir,

Your obedient servant,

(Sgd.) DUNCAN ANDERSON.

On March 1, 1911, Mr. R. E. Everest was appointed Superintendent of the Experimental Station at Scott, and entered upon his duties without delay. He has purchased horses and the necessary implements for carrying on the work and expects to have some crops to report on as the results of next season's work. Mr. Everest has had experience on some of the best farms in Ontario, is a graduate of the Ontario College of Agriculture at Guelph, and has had two years' experience in the Canadian Northwest as foreman on the Experimental Station at Lacombe under Mr. G. H. Hutton.

CO-OPERATIVE EXPERIMENTS BY FARMERS THROUGHOUT CANADA.

Another distribution was made this year from the Experimental Farms of samples of seed of high quality for the improvement of crops. The object in view in this distribution is to ascertain by test the relative merits of the different sorts under trial, as to quality, productiveness and earliness in ripening. In conducting these trial plots, farmers everywhere have readily undertaken to co-operate with the Experimental Farms and to report the results of their experiments. These joint efforts have been productive of much good and a great deal of information has thus been gathered as to the suitability of these different varieties to the climatic conditions prevailing in different parts of Canada.

During the season of 1910, the number of Canadian farmers who have united in these experiments was 43,385. The value of this work in all parts of the Dominion has been abundantly demonstrated.

A change was made this year in the system of distributing samples; these, with the exception of potatoes, are now sent out from the Central Farm, and all applications for samples should be addressed to the Dominion Cerealist, Central Experimental Farm, Ottawa. The regular distribution of samples of grain from the Branch Experimental Farms has been discontinued, and the surplus grain grown there will be sold in lots of one bushel or more, to farmers for seed purposes.

The samples sent out from the Central Farm have weighed as follows:—Wheat and barley, five pounds each, and oats four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, peas and potatoes have weighed three pounds each.

DISTRIBUTION of samples by Provinces.

Name.	P.E.I	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Oats	509	931	1,141	5,172	1,593	603	938	729	63
Barley	53	310	177	1,804	316	191	397	292	33
Wheat	246	529	620	3,473	451	855	3,025	1,281	56
Peas	33	192	329	1,199	275	122	330	292	58
Indian Corn	15	86	98	698	294	79	73	68	17
Potatoes	52	594	505	2,361	1,747	773	1,867	1,381	434
Total	908	2,642	2,870	14,707	4,676	2,623	6,630	4,046	661

Total number of samples distributed, 39,763.

Total number of packages of each sort distributed—

Oats	11,679
Barley	3,573
Wheat	10,539
Peas	2,830
Indian corn	1,428
Potatoes	9,714
Total	39,763

DISTRIBUTION FROM THE CENTRAL FARM.

The following list shows the number of samples of the different varieties which have been sent out from the Central Experimental Farm—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		SPRING WHEAT.	
Banner	4,858	Red Fife	3,672
Wide Awake	1,370	Marquis	2,112
White Giant	1,366	Preston	1,712
Abundance	972	White Fife	810
Improved Ligowo	963	Bobs	526
Thousand Dollar	955	Chelsea	483
Danish Island	946	Stanley	461
Daubeney	249	Pringle's Champlain	385
		Huron	378
Total	11,679	Total	10,539
BARLEY—(Six-Row).		INDIAN CORN.	
Mensury	1,778	Longfellow	430
Odessa	739	Selected Leaming	278
Mansfield	369	Compton's Early	268
BARLEY—(Two-Row).		Angel of Midnight	267
Invincible	383	White Cap Yellow Dent	149
Standwell	179	Early Mastodon	36
Canadian Thorpe	125	Total	1,428
Total	3,573	POTATOES.	
PEAS.		Rochester Rose	4,705
		Gold Coin	1,678
Golden Vine	1,395	Money Maker	1,517
Arthur	1,082	Carman No. 1	1,049
Daniel O'Rourke	353	Irish Cobbler	765
Total	2,830	Total	9,714

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the branch Experimental Farms as follows—

Experimental Farm, Nappan, N.S.

Spring wheat	62
Oats	314
Barley	71
Buckwheat	87
Potatoes	280
Total	814

Experimental Farm, Brandon, Man.

Potatoes	114

Experimental Farm, Indian Head, Sask.

Spring wheat	309
Oats	163
Barley	39
Peas	84
Sundries (flax, rye)	19
Potatoes	440
Total	1,054

Experimental Station, Lethbridge, Alta.

Winter wheat	13
Potatoes	833
Total	846

Experimental Farm, Agassiz, B.C.

Oats	140
Barley	68
Peas	132
Potatoes	454
Total	794

By adding the number of farmers supplied by the branch Farms to those supplied by the Central Farm, we have a total of 43,385. The average number of samples sent out each year for the past eleven years has been over 38,000.

It is remarkable how rapidly a supply of grain may be built up from a single four or five-pound sample. Take, for instance, a sample of oats. The four pounds received will, if cared for, usually produce from three to four bushels. This sown on two acres of land, will, at a very moderate estimate, give one hundred bushels, and sometimes much more, but taking the lower figure as the basis for this calculation, the crop at the end of the second year would be sufficient to sow fifty acres, which, at

the same moderate comparison, would furnish 2,500 bushels available for seed or sale at the end of the third year.

The critical point of these tests is the threshing of the grain at the end of the first season, and it is here that some farmers fail to get the full advantage of the experiment. The product of the one-twentieth acre plot is sometimes threshed in a large machine, which it is difficult to thoroughly clean, and in this way the grain becomes mixed with other varieties and with weed seeds and is practically ruined. At the Central Experimental Farm we thresh the produce of many of the small plots of grain by cutting off the heads, placing them in sacks and beating them with a stick, then winnowing until most of the chaff is got rid of, and the grain made clean enough for sowing.

Where the farmer is to use this seed for his own sowing it is not necessary that the sample be entirely free from chaff. It is, however, most essential, if he is to get the full benefit of his experiment that the grain be quite free from all admixture with other sorts of grain or with weeds. Farmers are expected to harvest the product of their experiment plot separately, and store it away carefully, threshing it by hand either with a flail or in such other manner as they may prefer. The results to be gained will abundantly repay the cost of careful handling of the grain.

Every season after the regular free distribution of the samples has been provided for, the surplus grain grown on the Experimental Farms not required for sowing is sold to farmers in quantities of from two to six bushels or more each. In this way, a considerable number of farmers are supplied every year with seed grain in these larger quantities, especially from the branch Farms at Brandon, Manitoba; Indian Head, Saskatchewan; and at Lethbridge, Alberta.

CORRESPONDENCE.

The correspondence carried on during 1910-11, between the farmers of Canada and the officers of the Experimental Farms and Stations has been very large.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters and reports sent out at the Central Experimental Farm from April 1, 1910, to March 31, 1911—

	Letters Received.	Letters Sent.
Director	45,325	8,558
Agriculturist	3,915	6,218
Horticulturist	2,859	2,692
Cerealist	18,108	19,370
Chemist	2,067	2,203
Entomologist	2,476	3,845
Botanist	899	1,245
Poultry Manager	5,002	6,329
Accountant	1,644	2,917
	82,295	43,377

Many of the letters received by the Director are applications for samples of seed grain or for the publications issued by the Experimental Farms; most of these are answered by mailing the material asked for, accompanied in most instances by circular letters. This will explain why the number of letters received by that officer so much exceeds the number sent out.

DISTRIBUTION OF REPORTS, BULLETINS AND CIRCULAR LETTERS.

Reports and Bulletins mailed	242,470
Circulars and letters relating to samples of seed grain ..	44,624

BRANCH EXPERIMENTAL FARMS AND STATIONS.

The correspondence conducted by the Superintendents of the Branch Experimental Farms and Stations is also large, as is shown by the following figures:—

	Letters Received.	Letters Sent.
Experimental Station, Charlottetown, P.E.I.	532	500
" Farm, Nappan, N.S.	2,536	2,212
" Station, Cap Rouge, P.Q.	390	510
" Farm, Brandon, Man.	3,545	3,394
" Farm, Indian Head, Sask.	10,191	9,974
" Station, Rosthern, Sask.	396	342
" Station, Lethbridge, Alta.	2,600	2,380
" Station, Lacombe, Alta.	3,710	3,591
" Farm, Agassiz, B.C.	4,983	4,869
	28,883	27,772

Much additional information has also been sent out from the branch Farms and Stations by printed circulars. By adding the correspondence conducted at the Branches to that of the Central Farm, the total number of letters received is found to be 111,178 and of those sent out 71,149.

BULLETINS AND PAMPHLETS ISSUED DURING THE YEAR ENDING MARCH 31, 1911.

In addition to reprints of Bulletins No. 47, Trees and Shrubs tested in Manitoba and the Northwest Territories, and No. 49, the Potato and its Culture, four new bulletins were issued during the year—

Bulletin No. 66 of the Experimental Farm series was prepared by the Dominion Cerealist, Dr. C. E. Saunders. This treats of the results obtained on all the Dominion Experimental Farms from trial plots of grain, fodder corn, field roots and potatoes, in 1910, and is the sixteenth issue of this publication. The average results obtained for the last five years are also given of those varieties which have been long under trial and these records are arranged in the order of their yield. These trial plots are conducted with the object of gaining information as to the relative productiveness of the different sorts tested and their earliness in ripening in the different climates of Canada. The returns show much variation in the weight and earliness of the crops grown, and point to the importance of care in the choice of varieties of seed for sowing.

Bulletin No. 67, entitled Mangels, Sugar Mangels and Sugar Forage Beets was prepared by the Dominion Agriculturist, Mr. J. H. Grisdale. This treats of the feeding values of these roots and full information is given as to the proper method of preparing the land, sowing, cultivation, harvesting, housing and feeding them. An appendix to this bulletin has been prepared by the Dominion Chemist, Mr. Frank T. Shutt, treating of the chemical constituents of these roots.

Bulletin No. 68 of the regular series, entitled Progress in the Breeding of Hardy Apples for the Canadian Northwest, was prepared by myself. This bulletin presents, in a convenient form, the results so far attained in the endeavour to produce varieties of apples which will be sufficiently hardy for the Northwestern provinces.

Bulletin No. 6 of the second series, entitled 'Western Prairie Soils: Their Nature and Composition,' by the Dominion Chemist, Mr. Frank T. Shutt, deals with some of the chief characteristics of the soils of the western provinces of the Dominion, giving the results of a number of analyses of these soils which the author has made, with some deductions as to the effects of continuous cropping of the prairie soils. Some notes are made of the chief features of agriculture in the west and in the bulletin is included a report from Dr. Edward J. Russell, Rothampstead Experiment Station, Harpenden, England, on the mechanical characteristics of these soils. A map is also included, showing the prairie and wooded areas and the lines of the first and second steppes of the provinces of Manitoba, Saskatchewan and Alberta.

Pamphlet No. 7, by the Dominion Chemist, Mr. Frank T. Shutt, on the 'Preservation of Fruits for Exhibition Purposes,' treats of the experiments which have been conducted by the author and myself with various preservatives for this purpose, and the formulæ are given of those which have proven the most successful.

REPORT OF THE EXPERIMENTAL STATION AT PEACE RIVER, ALBERTA, FOR THE YEAR ENDING MARCH 31, 1911.

FORT VERMILION,
PEACE RIVER, ALBERTA, October 12, 1910.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Experimental Farms,
Ottawa.

SIR,—I have the honour to submit the third annual report of the work done at the Experimental Station, Fort Vermilion, during the past season, and also on agricultural conditions in general throughout this district.

The spring of 1910 opened early, and I was able to start seeding April 26, but seeding was not general until May 1. The germination of the grain was slow owing to the lack of moisture due to the small snowfall during the winter. The month of May was very dry and also the early part of June; when the first rains came, in the latter month, growth was very rapid. The first heavy rainfall was on June 18; the wheat was, at the time, not more than six or eight inches high, and the barley and oats not so far advanced, through having been sown later.

On June 28 we experienced a very heavy frost and the following plants received a severe set-back: Beans, melons, squash, cucumbers, corn and some of the peas; the potato tops were also badly touched in places.

Good growing weather prevailed throughout the rest of the month, with sufficient moisture. July opened favourably with abundant sunshine and frequent showers. No frost occurred during this month. The first of July saw Riga, Marquis, Ladoga

and Bishop wheats fully headed out, and Red Fife and Kubanka followed four days later. Oats commenced heading out on the 9th.

The hay crop was light on the high land owing to the dry season, but was plentiful in the swamps and around the lakes and, as a result, there is no shortage of feed in this district.

The conditions of the early part of August were favourable to all crops. On the night of the 14th, a slight frost occurred, but apparently did little damage; on the night of the 16th, however, there was a very heavy frost; the wheat on and around the Experimental Station was uninjured, but in other parts of the district it was badly damaged, especially on the north side of the river. The barley and oats were so far advanced that they escaped and are well up to the average. There will be about 5,000 bushels of wheat of saleable quality in the neighbourhood out of a possible 30,000 bushels, had the frost not occurred. Most of the injured wheat, though not saleable, will be good enough for grists and the rest for feed. This partial failure of the crops will thus not cause such distress as might appear. This frost also prevented the tomatoes from ripening and cut down the potato crops.

The first harvest work was done with barley, which was cut on August 13. The first wheat was cut on the 7th, and harvest became general on the 22nd. In this district, the crops were generally light, potatoes especially so.

Stacking was completed about September 24. Threshing has not yet been commenced.

The fruit trees and ornamental shrubs have done remarkably well. Some of the lilacs and other flowering shrubs were in bloom the greater part of the summer, and were the source of admiration and surprise to all who saw them. Many of the flowers are still in bloom (October 12), especially the pansies, which are still very brilliant, in spite of the many frosts.

I have the honour to be, sir,

Your obedient servant,

(Sgd.) ROBERT JONES.

EXPERIMENTS WITH CEREALS.

All the wheats, oats, barleys and peas were sown in plots of 1-60 of an acre each, twenty-two feet long by thirty-three feet wide with paths between the different plots so that the grain might not become mixed; sown in drills about seven inches apart.

Experiments with Spring Wheat.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw, including head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Ladoga........	Apr. 27	Aug. 26	122	46	6	3	Bearded	6,420	47	40	64
2	Riga........	" 27	" 17	113	43	10	3½	Bald....	6,505	46	40	64·5
3	Preston.........	" 26	" 27	124	42	8	4	Bearded	5,960	44	..	62
4	Red Fife.......	" 26	" 26	121	41	10	4¾	Bald....	5,186	43	44	62
5	Marquis........	" 26	" 26	123	42	10	4¼	" ...	7,008	40	..	65
6	Bishop	" 26	" 16	113	40	10	3¼	" ..	6,656	38	24	63

The average yield in 1910 of the six varieties of wheat under trial was 43 bushels 24 lbs. per acre.

	(Durum or Macaroni Wheat,											
1	Kubanka..	Apr. 29	Aug. 25	121	56	5	2½	Bearded	7,600	52	..	63·5

Experiments with Oats.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Average Length of Straw, including head.	Strength of Straw on a Scale of 10 Points.	Average Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Banner..........	Apr. 28	Aug. 15	109	56	8	9½	Br'nch'g	7,240	120	..	37·3
2	Tartar King.....	" 28	" 18	112	48	10	8	Sided...	6,892	95	10	36·7
3	Excelsior........	May 11	" 21	102	47	10	8½	" ...	5,020	72	..	36
4	Improv'd Ligowo	Apr. 29	" 18	111	48	8	8	Br'nch'g	6,020	70	20	39

The average yield in 1910 of the four varieties of oats under test was 89 bushels 10 lbs. per acre.

EXPERIMENTS WITH SIX-ROW BARLEY.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Length of Straw, including head	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1.	Claude..................	Apr. 29	Aug. 8	101	48	8	3½	4,960	71	2	49.5
2.	Mensury..................	" 29	" 12	105	41	5	3	4,768	57	16	50.0
3.	Champion...............	May 11	" 19	100	44	10	3	4,288	49	24	41

The average yield in 1910 of the three varieties of six-row barley under trial was 55 bushels 27 lbs. per acre.

EXPERIMENTS WITH TWO-ROW BARLEY.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Length of Straw, including head.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acre		Weight per measured bushel after cleaning.
					In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1.	Sidney..................	Apr. 29	Aug. 19	112	42	7	3¼	4,760	66	38	51·5
2.	Canadian Thorpe.......	" 29	" 15	108	39	5	3	4,130	66		53·0

The average yield in 1910 from the two varieties of two-row barley tested was 66 bushels 19 lbs. per acre.

EXPERIMENTS WITH PEAS.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Average Length of Straw.	Average Length of Pod.	Size of Pea.	Yield per Acre		Weight per measured bushel after cleaning.
						In.	In.		Bush.	Lbs.	Lbs.
1.	Arthur...............	Apr. 27	Aug. 16	111	strong	39	3	medium	36	13	62

EXPERIMENTS WITH FIELD ROOTS.

These were all sown in drills 2½ feet apart.

Carrots—Test of Varieties.

No.	Name of Variety.	When Sown.	When Pulled.	Size.	Yield.	
					Tons.	Lbs.
1	Ontario Champion	April 30	Sept. 22	Large	29	320
2	Improved Short White	May 2	" 20	Medium	24	960
3	Half-long Chantenay	"	" 20	"	23	80

Turnips—Test of Varieties.

No.	Name of Variety.	When Sown.	When Pulled.	Size.	Yield.	
					Tons.	Lbs.
1	Perfection Swede	May 3	Sept. 25	Large (some 19 lbs.)	22	432
2	Good Luck	"	"	Small	20	4

Sugar Beets—Test of Varieties.

No.	Name of Variety.	When Sown.	When Pulled.	Size.	Yield.	
					Tons.	Lbs.
1	Klein Wanzleben	May 3	Sept. 25	Large	20	1,904
2	New Danish	"	"	Medium	17	1,840
3	Vilmorin's Improved	"	"	Very small	15	720

Mangels—Test of Varieties.

No.	Name of Variety.	When Sown.	When Pulled.	Size.	Yield.	
					Tons.	Lbs.
1	Giant Yellow Globe	May 4	Sept. 26	Large	24	896
2	Mammoth Red	"	"	Medium	21	1,904

POTATOES.—Test of Varieties.

No.	Name of Variety.	When Sown.	When Pulled.	Size.	Yield.
1	Early Rose	May 2 and 4	Sept. 24	Medium	416½ bushels.
2	Carman No. 1	" 11	" 19	Large	52 lbs. from 7 lbs seed.
3	Gold Coin	" 11	" 19	Medium	30 lbs. from 2 lbs seed.
4	Irish Cobbler	" 11	" 19	Small	14 lbs. from 2 lbs seed.

INDIAN CORN—Test of Varieties.

No.	Name of Variety.	Height.	Sown in hills.	Yield per Acre.	
		Inches.		Tons.	Lbs.
1	Longfellow	50	May 11	7	592
2	Compton's Early	54	"	7	80
3	Extra Early Adams	44	"	5	720

All these varieties of corn were very green and frosted when cut on August 23, and their growth had been much retarded by drought. Two varieties of table corn. Malakoff and Golden Bantam, were sown, but did not succeed owing to the dry weather.

EXPERIMENTS WITH GRASSES AND CLOVERS.

SAINFOIN.—A small plot was sown on May 11. It produced a very strong growth. standing 3 feet high when cut on August 13.

ALFALFA.—The small plots of Alfalfa sown on May 16 did not do well. The plots were cut by hand on July 30, but there was not enough to rake up.

TIMOTHY AND BROME GRASS.—Sown last year. Did not yield over 1½ tons per acre. Timothy, Brome and Western Rye grass sown with a nurse crop of oats this year were a fairly good catch.

ORCHARD GRASS.—This was sown on a small plot of summer-fallow, without a nurse crop and is looking well.

VEGETABLES.

SOWN IN THE OPEN.

Lettuce.—Sown May 5; fit for use June 1.

Cabbage.—Produced some very fine specimens.

Radish.—Early Scarlet White Tip. Sown May 5; fit for use May 30. French Breakfast; sown May 5, fit for use May 25.

Parsnips.—Hollow Crown. Sown May 5. Very large; part left in ground for winter.

Table Carrots.—Guerande. Sown May 5; fit for use July 15; of very fine flavour.

Onions.—Danver's Yellow; sown May 5. Large Red Wethersfield; sown May 5. Both these varieties were taken up September 15 and were of medium size.

Table Turnips.—Early White Strapped.—Sown May 5; fit for use June 8. Of quite large size.

Parsley.—Extra Curled. Sown May 5; fit for use July 11.

Asparagus.—Conover's Colossal. Sown May 6. Did fairly well. Plants from last year did very well.

SOWN IN HOT-BEDS.

Sown April 19. Set out May 24 and 26.

Cabbage.—Premium Large Late Flat Dutch. In use August 20; average weight 9 lbs. A very good variety; at the time of taking up, some of them weighed 16 lbs. each. Hanson. In use August 14; average weight 7½ lbs.; very solid. Extra Early Paris Market. In use July 12. Average weight 8 lbs. A very good variety. Early Jersey Wakefield. In use July 20; average weight 6½ lbs; a very fine variety. Marble Head Mammoth. In use August 30; average weight 9 lbs. Very large and solid; on October 2, some of these weighed 18 lbs. each.

Cauliflower.—Henderson's Snowball. In use August 1; average weight 5 lbs. A fine, solid variety, some of them weighing 9 lbs. each.

Extra Early Erfurt.—In use July 20; average weight 4½ lbs. A good variety.

June Cauliflower.—In use July 15; average weight 6 lbs.; had good large heads at the time of taking up.

Celery.—White Plume. In use September 1; very small in size.

Squash.—White Bush Scallop, Boston Marrow, Vegetable Marrow. These three varieties were very much set back by spring frost and were quite small. Golden Hubbard. Taken up September 4; some of this variety weighed 6 lbs. each.

Cucumbers and melons were killed by the spring frosts.

THE FLOWER GARDEN.

Variety.	Sown in Open.	In Bloom from.	Remarks.
Sweet Peas—			
King Edward	May 12	Aug. 8	These were all in bloom on Oct. 12.
St. George	" 13	" 9	
Dorothy Eckford	" 13	" 4	
George Herbert	" 13	" 3	
Mrs. Collier	" 13	" 2	
Superb New Spencer	" 13	" 6	
Queen Victoria	" 13	" 6	
Helen Lewis	" 12	" 3	
Prince Olaf	" 12	" 8	
Mixed varieties (S.B. & Co.)	" 5	July 20	
Centaurea (Corn Flower)	" 13	" 21	Very good.
Heliotrope	" 12		Did not germinate.
California Poppy	" 12	July 2	Profuse bloom.
Candytuft (Empress)	" 12	" 2	Good.
Alyssum	" 12	" 21	Very fine.
Clarkia Mixed	" 12	" 7	Did well.
Coreopsis	" 12	" 30	Bloomed freely.
Godetia	" 12	Aug. 2	Grand show.
Iceland Poppy	" 12	" 16	Only 3 plants did well.
Pansies, 4 varieties	" 13	July 30	Very handsome colours.
Portulaca	" 13	" 25	Bloomed well.
Asters, 4 varieties	" 13	Aug. 2	Fair.
Ice Plant	" 13		Very good; large.
Stocks	" 13	July 30	Good.
Scabiosa, 2 varieties	" 13	Aug. 2	Did well.
Poppy, 4 varieties	" 13	July 6	Did well.
Balsam, Camelia Flowered	" 5		Killed by frost Aug. 16.
Salpiglossis	" 5	Aug. 1	Very good.
Sunflower, Globe of Gold	" 5	July 16	Bloomed well.
Delphinium (Larkspur)	" 5		Good growth.
" "	Sown last year	July 2	Great show of bloom.
Daisies	May 7	Sept. 1	Very fine.
Mignonette	" 7	July 4	Fine bloom.
Nasturtium, climbing	" 14	" 16	Great show of bloom.

SOWN IN HOT-BED, April 13. Planted out May 20.

Verbena hybrida, Mammoth.
Antirrhinum, 2 varieties. None of these was in bloom till September 15.
Dianthus, 2 varieties.
Phlox Drummondi.
Nasturtium, Dwarf, May 14; July 23. Very fine bloom.
Marigold, May 13; July 16. Did very well.

FRUITS, TREES AND SHRUBS,

Of the cross-bred apples under test at Fort Vermilion, the following are reported, under date of September 10, 1910, as doing well: Alberta, Tony, Prince, Golden, Magnus, Silvia, Pioneer and Robin. These have all proved hardy and have made good growth. Robin had one specimen of fruit last year which Mr. Jones picked and forwarded to Ottawa. It reached its destination safely, but had been picked too soon; it was not much more than about half size. Some seedlings of the cross-bred apples have been grown and are doing well; they are seedlings of Alberta, Golden, Jewel, and Silvia. Several Russian apples are also reported as doing well, namely, Charlamoff, Varna and Morden.

Among the plums still surviving and reported as doing well are Aitken, Odegard, Mankato and seedlings of Carsterson. As the plums have not yet fruited, Mr. Jones expresses the fear that the climate of Fort Vermilion may be a little too severe for them.

The black currants, of which there are eleven varieties growing, are all doing well, having made a strong growth. The birds, however, have kept a watchful eye on the ripening fruit and appropriated a large proportion of that which has matured. The red and white varieties have also made good growth and have fruited well.

Of raspberries, the Herbert and Heebner are both doing satisfactorily. Strawberries have suffered much from the severe climate and all the plants have died.

Of the ornamental trees and shrubs, the following are reported as doing well:—

Acer dasycarpum.
  " *negundo.*
  " *tataricum ginnala.*
  " *pictum.*
Amelanchier vulgaris.
Betula alba.
  " " *laciniata.*
Berberis sinensis.
  " *Thunbergii.*
Caragana arborescens.
  " *frutescens.*
  " *grandiflora.*
  " *pygmaea.*
Of *C. pygmaea*, Mr. Jones says that it was blooming all summer.
Clematis montana.
Cotoneaster tomentosa.
Crataegus Arnoldiana.
  " *carrieri.*
Celtis occidentalis.
Ceanothus Americanus.
Diervilla lutea.
Eleagnus Augustifolia (Russian Olive)
Euonymus Europaeus ovatus.
  " *linearis.*
Fraxinus Pennsylvanica lanceolata. (Green Ash).
Hydrangea paniculata grandiflora.
Ligustrum amurense.
Lonicera alpina.
  " *Fenzlei.*
  " *mundeniensis* (has bloomed well)
  " *Sullivanti.*
  " *virginalis alba.*
Lycium Europaeum.
Philadelphus Mont Blanc.
Populus angustfolia.
Quercus rubra.
Rhamnus frangula.
Ribes aureum.
Roses—
  Persian Yellow.
  Souvenir Philemon Cochet.
  Delicata,
and two other varieties, the names or which are lost. These have all bloomed well.

Spiraea arguta (very fine. In bloom May 25).
  " *Billardi* (in bloom July 13).
  " *sorbifolia* (in bloom July 8).
Salix Voronesh.

Syringa amurense.
" *Japonica.*
" *Pekinensis.*
" *rothomagensis.*
" *villosa* (in bloom June 1).
" *vulgaris,* Chas. Joly (in bloom June 1).
" " Chas. X.
" " Congo.
" " Emilie Lemoine.
" " Jacques Calot.
" " Mad. Abel Chatenay.
" " Mad. Casimir Perier.
" " Mdlle. Fernande Viger.
" " Michel Buchner (in bloom June 5.)
Viburnum molle.

EVERGREENS.

Abies remonti (doing very well).
Picea pungens (growing very slowly).
Pinus strobus, White Pine (doing well).
" *sylvestris,* Scotch Pine (doing fairly well).
Retinospora pisifera (doing well).
Pseudotsuga Douglasii, Douglas Spruce (doing finely).
Thuya occidentalis (doing well).
" " *Columbia* (doing finely).
" " *globosa* (doing very well).
" " *Hoveyii* (doing well).

Several plants of *Delphinium,* raised from seed grown at Indian Head, have done very well and bloomed profusely.

SOME Weather Observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River, Alberta

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
	°	°	°				
APRIL.							
Ottawa	47·69	76·0	22·0	2·06	0·87	174·5	5·81
Fort Vermilion	35·68	62·9	16·0	0·32	0·30	144·1	4·80
MAY.							
Ottawa	54·16	79·5	34·0	1·86	0·50	198·4	6·40
Fort Vermilion	46·93	79·2	19·5	0·39	0·31	217·0	7·00
JUNE.							
Ottawa	64·80	89·4	32·5	1·24	0·27	231·4	7·71
Fort Vermilion	56·10	89·5	29·0	1·73	1·09	302·6	10·08
JULY.							
Ottawa	70·40	92·8	52·0	2·38	0·62	265·1	8·55
Fort Vermilion	59·98	81·1	38·0	2·33	0·90	308·2	9·94
AUGUST.							
Ottawa	66·74	87·2	42·4	4·32	0·97	237·6	7·66
Fort Vermilion	53·48	84·0	24·8	0·97	0·40	322·5	10·40
SEPTEMBER.							
Ottawa	55·70	77·0	35·8	2·06	1·06	202·0	6·73
Fort Vermilion	46·01	77·0	20·1	1·01	0·25	152·3	5·07
OCTOBER.							
Ottawa	46·92	73·0	25·0	3·76	1·47	153·1	4·93
Fort Vermilion	34·80	63·9	7·5	0·60	0·19	116·3	3·75
NOVEMBER.							
Ottawa	32·27	57·2	17·0	1·79	0·45	46·8	1·56
Fort Vermilion	5·75	33·9	—26·2	0·77	0·35	47·1	1·57
DECEMBER.							
Ottawa	11·80	35·5	—25·2	1·64	0·67	93·1	3·00
Fort Vermilion	—5·16	35·5	—52·9	0·85	0·30	39·3	1·26

SOME Weather Observations taken at Central Experimental Farm, Ottawa, as compared with those taken at Fort Vermilion, Peace River, Alberta.—*Continued.*

JANUARY.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
	°	°	°				
Ottawa	11·38	40·0	—17·8	1·56	0·50	98·1	3·16
Fort Vermilion	—29·55	3·2	—78·0	0·97	0·30	71·9	2·31

FEBRUARY.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
Ottawa	12·34	38·7	—17·0	2·82	0·85	113·2	4·04
Fort Vermilion	—4·00	44·0	—59·6	0·20	0·10	114·9	4·10

MARCH.

	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Total Precipitation.	Heaviest in 24 hours.	Total hours Sunshine.	Average Sunshine per day.
Ottawa	21·67	46·2	—7·0	2·22	0·90	189·1	6·10
Fort Vermilion	14·46	49·0	—40·2	0·41	0·15	151·4	4·88

RECORD of Sunshine at Fort Vermilion, Peace River District, Alberta, from April 1. 1910, to March 31, 1911.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	24	6	144·1	4·80
May	30	1	217·0	7·00
June	29	1	302·6	10·08
July	28	3	308·2	9·94
August	31	0	322·5	10·40
September	23	7	152·3	5·07
October	25	6	116·3	3·75
November	13	17	47·1	1·57
December	15	16	39·3	1·26
January	19	12	71·9	2·31
February	24	4	114·9	4·10
March	29	2	151·4	4·88

(Signed) WILLIAM T. ELLIS,
Observer.

TABLE of Meteorological Observations taken at Fort Vermilion, Peace River District, Alberta, from April 1, 1910, to March 31, 1911, showing maximum, minimum, and mean temperature, also highest and lowest for each month with date of occurrence; also rainfall, snowfall, and total precipitation.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall	Snowfall.	Total precipitation.	Number of days. Precipitation.	Heaviest in 24 Hours.	Date.
	°	°	°	°	°		°							
April	46·02	25·35	20·67	35·68	62·9	29th	16·0	6th	....	3·25	0·32	2	0·30	20th.
May	61·12	33·06	27·74	46·93	79·2	6th	19·5	15th	0·39	....	0·39	3	0·31	29th.
June	70·21	42·00	28·20	56·10	89·5	12th	29·0	3rd	1·73	....	1·73	6	1·09	18th.
July	72·63	47·35	25·27	59·98	81·1	13th	38·0	30th	2·33	....	2.33	11	0·90	2nd.
August	67·77	39·19	28·58	53·48	81·0	6th	24·8	26th	0·97	....	0·97	5	0·40	28th.
September	57·76	34·27	23·48	46·01	77·0	16th	20·1	24th	1·01	....	1·01	9	0·25	21st.
October	45·24	24·37	20·87	34·80	63·9	9th	7·5	27th	0·60	....	0·60	5	0·19	9th.
November	16·90	− 5·38	22·26	5·75	33·9	16th	−26·2	7th	....	7·75	0·77	4	0·35	11th.
December	7·00	−17·31	24·31	− 5·10	35·5	22nd	−52·9	29th	....	8·50	0·85	6	0·30	8th.
January	−18·80	−40·28	21·47	−29·55	3·2	5th	−78·0	11th	....	9·75	0·97	8	0·30	6th.
February	+12·05	−20·05	32·10	− 4·00	44·0	24th	−59·6	2nd	....	2·00	0·20	3	0·10	9th.
March	27·67	1·59	25·75	14·46	49·0	19th	−40·2	11th	....	4·25	0·41	5	0·15	13th.
									7·03	35·50	10·55	67		

REPORT OF EXPERIMENTS IN AGRICULTURE AND HORTICULTURE AT KAMLOOPS, B.C.

The following report, under date of March 31, 1911, has been received from Mr. E. W. Calhoun, Superintendent of the Harper ranch, Kamloops, B.C., on the results of some experiments which have been conducted, under the instructions of the Minister of Agriculture, by the Director of Experimental Farms, on ten acres of land set aside for that purpose.

It is proposed to conduct, from year to year, on this land, experiments with winter wheat and spring grains; a portion also has been set aside for the testing of varieties of apples. These tests are being arranged so as to gain experience as to the best methods to follow in growing grains and fruit trees under the dry conditions which prevail in the vicinity of Kamloops.

HARPER RANCH, KAMLOOPS, B.C., March 31, 1911.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I beg to submit herewith a report of the work done during the past season on the ten acres of land placed at the disposal of the Dominion Department of Agriculture on the Harper ranch, Kamloops, B.C.

After fencing, this land was first broken in May, 1909, and backset in June; the ground was very dry at the time, but the fall grains were seeded in August, and the packer was used as directed. During the following winter, we had a very light snowfall which did not exceed four inches in all, and only lasted for three days. In a climate like this, where the evaporation is so great and the snowfall so very light, the land was really drier in the spring when the vegetation should have started, than it was in August when the grain was seeded.

On January 9, two samples of winter wheat which had been grown on one acre of the land seeded August 31 at the rate of one bushel per acre, were sent to the Experimental Farm at Ottawa. This grain headed out about June 2, 1910, and was cut on July 5.*

The plot seeded at the rate of about thirty lbs. per acre, owing to the unfavourable season, yielded very little, while the spring grains, for the same reason, were practically a failure.

APPLE TREES.

We received from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm at Agassiz, sixty-one yearling apple trees which were planted on April 8 about four inches deeper than they had been in the nursery. Each tree was given about three gallons of water at the time of planting and on May 3 a similar watering was given, removing enough of the loose earth from the surface so as to hold the water close to the tree, and, as soon as it had soaked into the ground so that it would not puddle, we filled it again with the dust mulch so as to retain the moisture. In June, a similar watering was given. With the exception of three trees, they all survived, and apparently went into the winter in good condition.

Yours truly.

(Sgd.) E. W. CALHOUN.

* When received, this wheat was handed to the Dominion Cerealist, who reports on it as follows:— 'The sample of Kharkov winter wheat which has been received from Kamloops from the crop raised there last season, is excellent, hard wheat, of admirable appearance, and weighing a little over 65 lbs. per bushel.'

Driveway leading to Director's House, Central Farm Ottawa.

Photo by FRANK T. SHUTT.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The following report includes tests of grain and other seeds grown on the several Experimental Farms, as well as those bought with the object of growing them on the Farms. The list also includes tests of the vitality of a number of specimens of grain grown in the several provinces of the Dominion, from the samples distributed from the Central Experimental Farm. These tests have been made with the object of ascertaining what climatic conditions are most favourable for producing seed of high vitality, and how far this desirable quality is likely to be influenced by variations in character of season. Formerly, these tests included a number of doubtful samples which were believed, by the parties sending them, to have been injured in their vitality by exposure to unfavourable conditions. All such samples are now referred to the Seed Commissioner, Department of Agriculture, Ottawa, for report. The results reported on here are the average proportions of vitality shown by samples of grain grown in different parts of the several provinces of Canada, under healthy and normal circumstances. In the following table, showing the results by provinces, the total percentage of vitality is given, also the percentage of strong kernels and of those of weak growth.

RESULTS OF TESTS OF SEEDS FOR VITALITY, 1910-11.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	506	100·0	59·0	90·2	2·1	92·3
Barley	433	100·0	51·0	89·3	3·5	92·8
Oats	454	100·0	28·0	90·4	2·8	93·2
Rye	11	99·0	67·0	85·0	2·8	87·8
Peas	113	100·0	60·0	....	....	89·9
Beans	7	100·0	72·0	....	....	94·2
Flax	20	91·0	49·0	....	....	76 2
Grass	1	12·0	12·0	....	....	12·0
Maple	1	9·0	9·0	....	....	9·0
Ash	1	2·0	2·0	....	....	2·0
Total number of samples tested, highest and lowest percentage	1,547					

TABLE SHOWING RESULTS OF GRAIN FOR EACH PROVINCE FOR 1910-11.

Kind of Seed	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	141	100·0	70·0	92·0	2·2	94·2
Barley	114	100·0	53·0	92·1	2·2	94·4
Oats	76	100·0	88·0	96·0	1·5	97·5
QUEBEC.						
Wheat	30	100·0	62·0	90·8	1·7	92·5
Barley	31	100·0	77·0	93·0	1·7	94·7
Oats	35	100·0	73·0	91·4	2·6	94·0
MANITOBA.						
Wheat	50	100·0	81·0	93·5	1·4	94·9
Barley	40	100·0	80·0	89·4	3·5	93·0
Oats	45	100·0	28·0	91·8	2·2	94·1
ALBERTA.						
Wheat	102	100·0	66·0	86·3	2·4	88·8
Barley	82	100·0	65·0	89·1	2·7	91·8
Oats	90	100·0	30·0	86·1	4·2	90·4
SASKATCHEWAN						
Wheat	80	100·0	67·0	91·2	2·1	93·3
Barley	47	100·0	51·0	91·8	1·7	93·6
Oats	52	100·0	44·0	84·2	3·7	88·0
NOVA SCOTIA.						
Wheat	33	99·0	71·0	88·8	2·0	90·9
Barley	61	100·0	72·0	81·3	8·2	89·5
Oats	51	100·0	52·0	90·4	2·7	93·2
NEW BRUNSWICK.						
Wheat	26	100·0	59·0	88·5	1·7	90·2
Barley	8	100·0	71·0	86·7	5·8	92·6
Oats	32	100·0	77·0	91·2	2·5	93·8
PRINCE EDWARD ISLAND.						
Wheat	32	99·0	59·0	86·8	2·5	89·4
Barley	29	99·0	55·0	84·3	5·6	89·9
Oats	53	100·0	75·0	91·2	2·8	94·0
BRITISH COLUMBIA.						
Wheat	12	100·0	86·0	95·1	1·6	96·8
Barley	21	100·0	92·0	94·6	2·9	97·5
Oats	20	100·0	87·0	96·1	1·3	97·6

(Signed) WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE of meteorological observations taken at the Central Experimental Farm, Ottawa, from April 1, 1910, to March 31, 1911, giving maximum, minimum and mean temperature for each month, with date of occurrence, also the rainfall, snowfall and total precipitation.

Month	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°							
April	57·81	37·57	20·24	47·69	76·0	5th	22·0	13th	2·06	·5	2·06	13	0·87	18th
May	64·31	44·01	20·30	54·16	79·5	29th	34·0	13th	1·86	......	1·86	14	0·50	30th
June	76·34	53·27	23·06	64·80	89.4	22nd	32·5	4th	1·24	......	1·24	14	0·27	6th
July	81·88	58·93	22·95	70·40	92·8	9th	52·0	29th	2·38	......	2·38	15	0·62	3rd
August	77·94	55·56	22·37	66·74	87·2	3rd	42·4	27th	4·32	......	4·32	16	0·97	18th
September	66·56	44·84	21·72	55·70	77·0	17th	35·8	22nd	2·06	......	2·06	13	1·06	6th
October	55·21	38·32	17·21	46·92	73·0	5th	25·0	13th	3·69	0·75	3·76	14	1 47	6th
November	36·98	27·56	9·42	32·27	57·2	1st	17·0	21st	0·85	9·50	1·79	12	0·45	30th
December	20·13	3·49	16·63	11·80	35·5	24th	−25·2	31st	......	16·50	1·64	16	0·67	30th
January	22·99	−0·20	23·17	11·38	40·0	3rd	−17·8	18th	0·02	15·50	1·56	15	0·50	9th
February	21·38	3·31	18·06	12·34	38·7	26th	−17·0	6th	0·20	26·25	2·82	10	0·85	12th
March	31·36	11·99	19·36	21·67	46·2	26th	−7·0	4th	0·26	19·75	2·22	14	0·90	22nd
									18·94	88·25	27·71	166		

Rain or snow fell on 166 days during the 12 months.

Heaviest rainfall in 24 hours, 1.47 inches on October 6.

Heaviest snowfall in 24 hours, 9.00 inches on March 22.

The highest temperature during the 12 months was 92.8° on July 9.

The lowest temperature during the 12 months was 25.2° on December 31.

During the growing season rain fell on 13 days in April, 14 days in May, 14 days in June, 15 days in July, 16 days in August and 13 days in September.

February shows the lowest number of days with precipitation, viz., 10 days.

Total precipitation during the 12 months 27.72 inches, as compared with 34.51 inches during 1909-10.

RAINFALL, SNOWFALL AND TOTAL PRECIPITATION from 1890 to 1910-11, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·72
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
1905	23·71	87·25	32·42
1906 January 1 to March 31	1·90	24·50	4·34
1906-07	21·73	72·50	28·94
1907-08	24·70	134·75	38·18
1908-09	22·13	107·90	32·91
1909-10	28·40	61·25	34·51
1910-11	18·94	88·25	27·72
Total for 21 years and 3 months	543·39	1,930·25	736·68
Average for 21 years	25·87	91·91	35·08

RECORD OF SUNSHINE at the Central Experimental Farm, Ottawa, from April 1, 1910, to March 31, 1911.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
April	27	3	174·5	5·81
May	26	5	198·4	6·40
June	29	1	231·4	7·71
July	29	2	265·1	8·55
August	30	2	237·6	7·66
September	27	3	202·0	6·73
October	25	6	153·1	4·93
November	16	14	46·8	1·56
December	22	9	93·1	3·00
January	22	9	98·1	3·16
February	20	8	113·2	4·04
March	28	3	189·1	6.10

(Signed) WILLIAM T. ELLIS,
Observer.

EXPERIMENTS IN THE DECREASE OF VITALITY OF GRAIN THROUGH AGE.

FIRST EXPERIMENT.

In 1898, some experiments were begun to gain information as to the relative decrease of vitality which occurs with age when the important cereals are kept under the conditions which prevail in an ordinary office, the grains being stored in cotton bags.

Three varieties of wheat were used, Red Fife, Preston and Red Fern; three varieties of oats, Banner, Prize Cluster and Scottish Chief; two varieties of barley, one of two-row, Canadian Thorpe, and one of six-row Mensury; two of peas, Daniel O'Rourke and White Marrowfat and one variety of flax.

These samples, at the time of selection, were of high vitality, ranging from 81 to 100 per cent, and were plump and well-developed.

In all these tests one hundred kernels have been used in each case, and the test has invariably been made in the soil. The work of testing has been done under my supervision, by Mr. W. T. Ellis, who is a most careful experimenter and observer.

The rapid decrease in the vitality of the wheat in the fourth year of testing is very striking and is still more marked in the fifth year. The Red Fern is a very strong growing sort, but why it should show a greater vitality than Red Fife or Preston I am unable to suggest any explanation.

With reference to the oats also, the decrease is not serious until the fifth year, but the vitality falls quite low in the sixth and seventh years. The vitality of the two-row barleys was very fully run out by the fourth year and was entirely exhausted on the fifth. The six-row varieties show a much higher and more enduring degree of germinating power. The same may be said of the peas.

This series of experiments was carried on for seven years, from 1898 to 1904.

Decrease in the Vitality of Grain with Age.

FIRST EXPERIMENT.

Variety.	1898.			1899.			1900.			1901.			1902.			1903.			1904.		
	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.
Wheats—																					
Red Fife, I.H.	91	83	8	83	67	1[illegible]	7[illegible]	73	2	19	15	4	3	2	1	...	...	...	...	...	...
Preston, C.E.F.	87	82	5	89	82	7	8[illegible]	76	8	39	36	3	4	1	3	...	.	...	...	...	.
Red Fern, C.E.F.	62	48	14	75	71	4	7[illegible]	68	5	54	43	11	38	34	4	17	17	...	...	...	...
Oats—																					
Banner, I. H.	81	72	9	94	87	7	8[illegible]	80	6	71	64	7	56	48	8	39	33	6	23	17	6
Banner, C.E.F.	92	86	6	93	85	8	87	76	11	71	63	8	75	69	6	45	38	7	29	15	4
Prize Cluster	94	89	5	93	88	5	71	66	5	70	62	8	67	65	2	30	22	8	28	23	5
Scottish Chief	94	84	10	92	86	6	69	61	8	56	44	12	18	16	2	4	3	1	7	5	2
Barleys—																					
Canadian Thorpe	94	91	3	84	78	6	60	56	4	11	7	4	...	...	...	...	...	...	...	...	...
Mensury	100	98	2	98	96	2	97	91	6	61	59	2	39	35	4	15	15	...	2	2	...
Peas—																					
Daniel O'Rourke	98	...	...	92	...	...	98	...	...	70	...	...	76	...	...	6	...	...	10	...	...
Large Wh. Marrowfat	90	...	...	98	...	...	78	...	. .	58	...	...	52	...	. .	6	...	. .	10	...	. .
Flax	81	...	...	82	...	...	75	...	...	49	...	...	26	...	...	24	...	...	2	...	...

Decrease in the Vitality of Grain with Age.

FIRST EXPERIMENT.

Year.	Highest Vitality. Variety.		Lowest Vitality. Variety.		Average.
	Wheats.	p. c.		p. c.	p. c.
1898..	Red Fife, I.H....	91	Red Fern, C.E.F....	62	80·00
1899..	Preston, C.E.F....	89	Red Fern, C.E.F....	75	82 33
1900..	Preston, C.E.F....	84	Red Fern, C.E.F....	73	77·33
1901..	Red Fern, C.E.F....	54	Red Fife, I.H....	19	37·33
1902..	Red Fern, C.E.F....	38	Red Fife, I.H....	3	15.00
1903..	Red Fern, C.E.F....	17	Red Fife, I.H.... Preston, C.E.F....	00	5·66
1904..	None....	.....	None....	.....	
	Oats.				
1898	Prize Cluster.... Scottish Chief....	94	Banner, I.H....	81	90·25
1899..	Banner, I.H....	94	Scottish Chief....	92	93·00
1900..	Banner, C.E.F....	87	Scottish Chief....	69	78·25
1901	Banner, I.H.... Banner, C.E.F....	71	Scottish Chief....	56	67·00
1902..	Banner, C.E.F....	75	Scottish Chief....	18	54·00
1903..	Banner, C.E.F....	45	Scottish Chief....	4	29·05
1904..	Banner, C.E.F....	29	Scottish Chief....	7	15·00
	Barley.				
1898..	Mensury....	100	Canadian Thorpe....	94	97·00
1899..	Mensury....	98	Canadian Thorpe....	84	91·00
1900.	Mensury....	97	Canadian Thorpe....	60	78·05
1901..	Mensury....	61	Canadian Thorpe....	11	36·00
1902..	Mensury....	39	Canadian Thorpe....	00	19·05
1903..	Mensury....	15	Canadian Thorpe....	00	7·05
1904..	Mensury....	2	Canadian Thorpe....	00	1·00
	Peas.				
1898..	Daniel O'Rourke....	98	White Marrowfat....	90	94·00
1899..	White Marrowfat....	98	Daniel O'Rourke....	92	95·00
1900.	Daniel O'Rourke....	98	White Marrowfat....	78	88·00
1901..	Daniel O'Rourke....	70	White Marrowfat....	58	64·00
1902..	Daniel O'Rourke....	76	White Marrowfat....	52	64·00
1903	Daniel O'Rourke.... White Marrowfat....	6 6	....	....	6·00
1904	Daniel O'Rourke.... White Marrowfat....	6	....	....	6·00

SECOND EXPERIMENT.

In 1903, a larger series of trials of samples of grain was planned and put into effect, the experiments being continued to the present, being nine years in all.

Two sets of samples were provided for this test, one set being kept under the same conditions as obtained in the First Experiment. The grain was put up in cotton bags and kept on a shelf in an office building where the temperature varied widely and where they were subjected to artificial heat during the winter. The other series were put up in the same way and were placed in a room in the upper part of a barn where there was no artificial heat and where the temperature in winter was very much the same as that out-of-doors. The experiment with those samples kept in a warm place was commenced in 1903, and those exposed to cold were tested for the first time a year later.

In this series of trials, fifteen varieties of spring wheat and three varieties of fall wheat, twenty varieties of oats, sixteen of six-row barley, ten of two-row barley and seventeen varieties of peas, were tested.

Under the influence of cooler temperatures, the loss of vitality in all the samples was slower than where kept in warmer temperatures. All the samples selected were from seed grown the previous year and were all of high vitality, plump and well developed. All samples marked C. E. F. were grown at the Central Experimental Farm, those marked Br. at Brandon, Man., and those marked I. H. at Indian Head, Sask.

Among the wheats, the winter varieties retained a high proportion of germinating power longer than the spring wheats but the difference is not marked after the sixth year, by which time, the specimens both in warm and in cold storage had almost entirely lost their germinating power.

Referring to the varieties of oats tested, the samples showed reasonably good vitality for five years and then dropped rapidly.

In the six-row barley, the original proportion of vitality was retained in cold storage for at least six years, after which it dropped materially, while in the warm house, the vitality was maintained in good proportion for five years and after that fell off rapidly.

Two-row barley in the warm room dropped considerably below fifty per cent on the fifth year, while that in the cold room reached the same position on the sixth year.

The main decrease in the vitality of the peas tested in the warm room occurred on the sixth year, dropping to 36 per cent, while those in the cold room showed 45 per cent of germinating power on their seventh year.

These experiments serve to show that it is safe to sow many sorts of seed when two or three years old, in case it is more convenient to do so, but the facts brought out seem to discredit the stories related about grain germinating after having been kept for long periods.

Wheat.	Jan., 1903.			Mar., 1904.			Mar., 1905.			Mar., 1906.			Mar., 1907.			Feb., 1908.			Mar., 1909.			Mar., 1910.			Mar., 1911.		
	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.
Stanley, Br.....warm	93	81	12	83	81	2	74	72	2	71	65	6	53	46	7	8	6	2	2	1	1	1	....	1	....	....	....
" Br.....cool	....	....	....	84	82	2	86	74	12	79	75	4	75	69	6	84	78	6	21	19	2	11	10	1	5	3	2
Wellman's Fife, Br.....warm	96	88	8	71	63	8	80	74	6	84	80	4	70	63	7	21	21	....	26	22	4	11	9	2	2	1	1
" Br.....cool	....	....	....	91	84	7	84	56	28	92	82	10	92	83	9	83	80	3	31	25	6	19	17	2	13	12	1
White Fife, Br.....warm	99	96	3	89	78	11	88	82	6	86	82	4	67	61	6	26	25	1	33	26	7	12	11	1	2	1	1
" Br.....cool	....	....	....	94	89	5	92	72	20	82	77	5	92	84	8	89	85	4	29	25	4	26	24	2	17	15	2
White Russian, Br.....warm	98	94	4	96	93	3	89	89	....	99	97	2	84	77	7	35	34	1	32	28	4	10	8	2	....	....	....
" Br.....cool	....	....	....	96	90	6	94	75	19	96	92	4	86	82	4	89	85	4	51	44	7	23	18	5	15	13	2
Dawn, I.H.....warm	92	85	7	82	74	8	70	54	16	73	65	8	74	71	3	46	41	5	4	3	1	6	4	2	....	....	....
" I.H.....cool	....	....	....	77	70	7	66	54	12	85	77	8	73	65	8	72	67	5	23	19	4	26	23	3	24	23	1
Early Riga, I.H.....warm	94	91	3	82	77	5	64	56	8	68	59	9	73	68	5	42	41	1	23	20	3	5	4	1	....	....	....
" I.H.....cool	....	....	....	92	89	3	76	60	16	90	83	7	75	66	9	69	61	8	28	24	4	30	23	7	20	17	3
Laurel, I.H.....warm	92	90	2	79	70	9	66	56	10	83	77	6	64	52	12	4	2	2	4	2	2	....	....	....	....	....	....
" I.H.....cool	....	....	....	85	79	6	82	65	17	89	80	9	75	57	18	68	58	10	6	4	2	5	4	1	2	....	2
McKendry's Fife, I.H.....warm	96	95	1	72	65	7	82	75	7	67	61	6	56	49	7	6	5	1	....	....	....	....	....	....	....	....	....
" I.H.....cool	....	....	....	92	89	3	78	61	17	77	70	7	61	52	9	58	49	9	1	1	....	....	....	....	....	....	....
Plumper, I.H.....warm	92	90	2	84	80	4	70	66	4	82	78	4	67	60	7	40	34	6	7	7	....	4	4	....	1	1	....
" I.H.....cool	....	....	....	92	92	....	92	76	16	86	83	3	82	72	10	86	80	6	33	26	7	24	22	2	22	19	3
Red Fife, I.H.....warm	96	94	2	85	68	17	72	65	7	75	69	6	47	37	10	2	1	1	....	....	....	....	....	....	....	....	....
" I.H.....cool	....	....	....	86	78	8	88	72	16	86	81	5	80	68	12	70	61	9	1	1	....	....	....	....	....	....	....
Red Fern, I.H.....warm	93	86	7	73	59	14	74	69	5	71	67	4	69	57	12	28	25	3	23	22	1	1	1	....	2	1	1
" I.H.....cool	....	....	....	78	70	8	80	70	10	80	72	8	71	63	8	61	56	5	39	34	5	24	23	1	9	7	2
Lakefield, C.E.F.....warm	100	90	10	74	72	2	79	75	4	60	54	6	43	42	1	7	4	3	1	1	....	....	....	....	....	....	....
" C.E.F.....cool	....	....	....	87	82	5	88	83	5	85	79	6	83	79	4	80	75	5	19	15	4	17	12	5	1	1	....
Minnesota 163, C.E.F.....warm	92	88	4	92	89	3	87	77	10	76	66	10	56	52	4	10	9	1	1	1	....	....	....	....	....	....	....
" C.E.F.....cool	....	....	....	95	91	4	91	79	12	89	83	6	83	76	7	69	65	4	19	17	2	2	1	1	1	1	....
Monarch, C.E.F.....warm	96	95	1	94	88	6	88	83	5	90	87	3	85	81	4	58	55	3	34	32	2	4	3	1	....	....	....
" C.E.F.....cool	....	....	....	99	97	2	88	82	6	92	88	4	87	83	4	94	90	4	34	30	4	24	22	2	15	14	1
American Bronze, C.E.F.....warm	96	91	5	95	93	2	87	85	2	97	92	5	89	84	5	51	46	5	52	48	4	10	10	....	5	5	....
" C.E.F.....cool	....	....	....	99	95	4	93	82	11	93	85	8	89	88	1	92	89	3	54	45	9	33	30	3	31	27	4
Buda-Pesth, C.E.F.....warm	100	97	3	93	85	8	83	75	8	87	81	6	79	71	8	44	41	3	53	47	6	25	23	2	4	2	2
" C.E.F.....cool	....	....	....	95	93	2	81	44	37	89	83	6	84	77	7	75	70	5	44	36	8	32	28	4	37	32	5
Early Red Clawson, C.E.F.....warm	97	94	3	93	90	3	75	68	7	81	78	3	85	77	8	53	47	6	61	55	6	37	35	2	5	4	1
" C.E.F.....cool	....	....	....	90	85	5	87	72	15	88	86	2	91	83	8	86	78	8	69	56	13	55	50	5	44	42	2
Huron, C.E.F.....warm	....	....	....	84	77	7	67	62	5	83	75	8	73	70	3	18	16	2	28	25	3	....	....	....	....	....	....
" I.H.....cool	....	....	....	91	87	4	73	44	29	85	79	6	72	66	6	63	60	3	16	10	6	23	21	2	5	4	1

Oats.	Jan., 1903. Total.	Jan., 1903. Strong.	Jan., 1903. Weak.	Mar., 1904. Total.	Mar., 1904. Strong.	Mar., 1904. Weak.	Mar., 1905. Total.	Mar., 1905. Strong.	Mar., 1905. Weak.	Mar., 1906. Total.	Mar., 1906. Strong.	Mar., 1906. Weak.	Mar., 1907. Total.	Mar., 1907. Strong.	Mar., 1907. Weak.	Feb., 1908. Total.	Feb., 1908. Strong.	Feb., 1908. Weak.	Mar., 1909. Total.	Mar., 1909. Strong.	Mar., 1909. Weak.	Mar., 1910. Total.	Mar., 1910. Strong.	Mar., 1910. Weak.	Mar. 1911. Total.	Mar. 1911. Strong.	Mar. 1911. Weak.
Abundance, I.H .... warm	90	79	11	91	79	12	84	64	20	84	77	7	46	32	14	31	21	10	20	12	8	3	2	1	1	....	1
" I.H. .... cool	....	....	....	82	74	8	67	36	31	82	69	13	69	51	18	67	62	5	21	13	8	16	10	6	21	17	4
Banner, I.H .... warm	97	91	6	85	75	10	78	53	25	76	73	3	47	38	9	52	46	6	25	11	14	5	4	1	1	....	1
" I.H .... cool	....	....	....	81	65	16	63	40	23	72	64	8	88	80	8	65	56	9	36	30	6	20	13	7	28	25	3
Bavarian, I.H .... warm	93	88	5	85	74	11	73	67	6	77	73	4	42	28	14	34	26	8	7	5	2	8	8	....	1	1	....
" I.H .... cool	....	....	....	79	66	13	69	53	16	72	61	11	64	57	7	67	60	7	26	21	5	20	16	4	17	11	6
Black Beauty, I.H .... warm	94	87	7	82	76	6	91	62	30	81	81	....	69	61	8	38	33	5	8	6	2	11	8	3	5	2	3
" I.H .... cool	....	....	....	84	76	8	74	44	30	89	84	5	74	66	8	75	67	8	44	33	11	32	30	2	22	14	8
Columbus, I.H .... warm	90	83	7	74	60	14	72	61	11	75	71	4	45	38	7	36	34	2	14	5	9	6	5	1	4	3	1
" I.H .... cool	....	....	....	74	65	9	80	65	15	72	64	8	51	42	9	56	45	11	26	21	5	25	21	4	29	25	4
Danish Island, I.H .... warm	95	88	7	87	80	7	90	73	17	80	73	7	51	44	7	54	45	9	29	18	11	18	15	3	8	5	3
" I.H .... cool	....	....	....	80	67	13	66	49	17	87	79	8	67	53	14	65	55	10	38	30	8	27	22	5	32	28	4
Golden Beauty, I.H .... warm	91	89	2	93	85	8	84	69	15	85	83	2	64	53	11	42	34	8	20	16	4	5	2	3	2	1	1
" I.H .... cool	....	....	....	87	77	10	72	57	15	93	91	2	67	59	8	75	67	8	29	23	6	29	27	2	24	21	3
Mennonite, I.H .... warm	96	90	6	89	82	7	74	53	21	67	58	9	42	31	11	33	21	12	27	23	4	2	2	....	1	1	...
" I.H .... cool	....	....	....	79	66	13	72	45	27	81	73	8	46	39	7	71	61	10	26	17	9	25	23	2	21	13	8
Thousand Dollar, I.H .... warm	93	86	7	65	58	7	71	58	13	77	72	5	42	32	10	37	24	13	26	12	14	....	....	....	5	2	3
" I.H .... cool	....	....	....	70	61	9	62	50	12	69	63	6	40	30	10	64	52	12	21	14	7	21	19	2	15	11	4
Tartar King, I.H .... warm	90	79	11	72	61	11	69	38	31	76	66	10	31	20	11	44	39	5	22	17	5	1	1	....	4	2	2
" I.H .... cool	....	....	....	82	70	12	53	42	11	60	51	9	51	36	15	62	51	11	21	12	9	21	19	2	17	13	4
Aitken's Black, C.E.F. .... cool	....	....	....	91	85	6	95	55	40	98	83	15	97	90	7	97	91	6	43	22	21	47	39	8	56	54	2
American Beauty, C.E.F. ...... cool	....	....	....	100	89	11	90	71	19	98	94	4	98	91	7	89	85	4	47	31	16	61	51	10	91	85	6
Banner, C.E.F. .... cool	....	....	....	98	84	14	98	56	42	95	89	6	97	93	4	76	73	3	53	40	13	41	31	10	66	59	7
Brandon, C.E.F. .... cool	....	....	....	100	91	9	96	73	23	100	96	4	91	80	11	91	82	9	71	64	7	66	62	4	70	63	7
Danish Island, C. E. F. .... cool	....	....	....	100	92	8	82	54	28	100	95	5	90	85	5	97	86	11	50	41	9	72	64	8	50	44	6
Early Gothland, C.E.F. .... cool	....	....	....	100	90	10	92	52	40	100	95	5	94	85	9	90	79	11	55	45	10	61	54	7	66	60	6
Goldfinder, C.E.F. .... cool	....	....	....	100	93	7	92	73	19	98	94	4	91	77	14	86	80	6	61	46	15	64	52	12	70	59	11
Liberty, C.E.F. .... cool	....	....	....	100	89	11	95	71	24	100	93	7	90	70	20	80	71	9	41	36	5	61	50	11	69	59	10
Prolific Black Tartarian, C.E.F. cool	....	....	....	100	89	11	88	66	22	100	93	7	92	82	10	94	89	5	42	31	11	67	57	10	75	62	13
Rennie's Prize White, C.E.F. .. cool	....	....	....	99	92	7	96	80	16	100	93	7	93	86	7	97	91	6	68	52	16	77	69	8	63	55	8

Six-row Barley.	Jan., 1903.			Mar., 1904.			Mar., 1905.			Mar., 1906.			Mar., 1907.			Feb., 1908.			Mar., 1909.			Mar., 1910.			Mar., 1911.		
	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.
Baxter's, I.H. ....warm	100	95	5	91	62	29	90	80	10	75	66	9	73	59	14	39	32	7	49	44	5	15	14	1	8	7	1
" I.H. ....cool	....	....	....	93	86	7	93	73	20	94	62	32	87	65	22	81	67	14	29	24	5	20	16	4	9	8	1
Champion, I.H. ....warm	100	97	3	92	78	14	86	67	19	76	67	9	78	61	17	41	31	10	35	31	4	3	2	1	3	2	1
" I.H. ....cool	....	....	....	98	86	12	91	73	18	93	81	12	87	64	23	83	72	11	24	17	7	20	15	5	18	14	4
Claude, I.H. ....warm	97	95	2	91	77	14	85	56	29	86	75	11	69	46	23	44	40	4	45	38	7	19	15	4	15	12	3
" I.H. ....cool	....	....	....	97	80	17	90	70	20	100	86	14	94	68	26	86	74	12	41	28	13	24	12	12	35	33	2
Mensury, I.H. ....warm	99	99	0	89	72	17	83	70	13	86	70	16	77	65	12	63	54	9	39	33	6	30	29	1	19	17	2
" I.H. ....cool	..	....	....	86	78	8	94	70	24	83	74	9	86	79	7	80	73	7	41	32	9	38	34	4	40	38	2
Oderbruch, I.H. ....warm	92	88	4	93	71	22	91	83	8	92	88	4	80	61	19	60	55	5	50	36	14	30	24	6	11	10	1
" I.H. ....cool	....	....	....	93	93	0	92	70	22	86	79	7	86	80	6	83	66	17	49	30	19	43	38	5	36	29	7
Odessa, I.H. ....warm	93	93	0	86	74	12	87	71	16	90	78	12	80	53	27	66	60	6	38	33	5	26	25	1	12	11	1
" I.H. ....cool	....	....	....	98	88	10	90	68	22	89	87	2	85	74	11	88	79	9	50	33	17	60	53	7	41	39	2
Rennie's Improved, I.H ....warm	....	....	...	96	92	4	87	78	8	89	76	13	73	51	22	83	80	3	54	49	5	30	28	2	23	18	5
" " I.H. ....cool	.. ..	....	....	95	92	3	100	90	10	87	86	1	93	85	8	87	67	20	67	47	20	47	40	7	64	54	10
Trooper, I.H. ....warm	95	87	8	97	93	4	81	69	12	80	64	16	64	52	12	51	45	6	31	25	6	9	8	1	7	6	1
" I.H. ....cool	....	....	....	98	95	3	90	80	10	95	91	4	80	68	12	81	58	23	31	15	16	21	19	2	26	25	1
Yale, I.H. ....warm	96	93	3	89	80	9	78	57	21	93	88	5	82	71	11	34	31	3	30	24	6	12	10	2	5	5	0
" I.H ....cool	....	...	....	91	85	6	86	71	15	88	77	11	90	85	5	73	53	20	21	12	9	21	15	6	21	20	1
Baxter, C.E.F. ....warm	97	94	3	100	94	6	93	84	9	93	88	5	94	86	8	48	42	6	71	66	5	53	49	4	28	25	3
" C.E.F. ....cool	....	....	....	98	97	1	100	96	4	98	96	2	94	78	16	98	94	4	89	78	11	82	72	10	35	34	1
Brome, C.E.F. ....warm	99	94	5	95	92	3	94	89	5	89	83	6	89	85	4	35	35	0	63	60	3	22	18	4	10	6	4
" C.E.F. ....cool	.. .		....	100	96	4	100	92	8	99	89	10	85	76	9	95	90	5	56	46	10	46	42	4	59	52	7
Nugent, C.E.F. ....warm	100	97	3	97	91	6	96	91	5	95	94	1	83	72	11	66	59	7	35	29	6	26	23	3	1	1	0
" C.E.F. ....cool	...	....	....	99	98	1	96	90	6	97	91	6	94	89	5	98	95	3	71	58	13	65	55	10	47	38	9
Odessa, C.E.F. ....warm	100	97	3	98	91	7	95	89	6	95	94	1	82	68	14	54	52	2	40	33	7	26	21	5	1	1	0
" C.E.F. ....cool	....	....	....	100	97	3	98	92	6	94	87	7	95	90	5	98	89	9	59	47	12	51	49	2	32	29	3
Rennie's Improved C.E.F. ....warm	100	98	2	99	95	4	98	90	8	100	99	1	94	84	10	77	74	3	70	65	5	35	33	2	39	36	3
" C.E.F. ....cool	...	....	....	100	97	3	100	95	5	90	85	5	94	92	2	95	87	8	78	67	11	72	69	3	78	73	5
Stella, C.E.F. ....warm	100	98	2	95	91	4	95	88	7	91	79	12	84	77	7	56	53	3	42	38	4	2	1	0	0	0	0
" C.E.F. ....cool	....	..	....	98	97	1	90	70	20	95	89	6	79	75	4	92	85	7	71	62	9	35	3	4	43	38	5
Yale, C.E.F. ....warm	100	95	5	94	91	3	96	89	7	89	78	11	76	50	26	34	30	4	41	38	3	22	20	2	3	2	1
" C.E.F. ....cool	...	....	....	97	96	1	95	85	10	94	89	5	93	91	2	96	92	4	62	52	10	42	38	4	29	28	1

Two-row Barley.	Jan., 1903.			Mar., 1904.			Mar., 1905.			Mar., 1906.			Mar., 1907.			Feb., 1908.			Mar., 1909.			Mar., 1910.			Mar., 1911.		
	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.	Total.	Strong.	Weak.
Beaver, I. H.................warm	97	93	4	90	83	7	88	82	6	68	62	6	51	43	8	14	10	4	7	5	2	....	....	....	..	....	....
" I.H ....cool	....	..	....	93	88	5	88	64	24	85	69	16	86	70	16	67	61	6	7	6	1	....	....	...	5	3	2
Canadian Thorpe, I.H........warm	100	95	5	95	83	12	90	81	9	60	55	5	46	32	14	18	16	2	5	5	..	1	1	....	....	....	....
" I.H. ....cool	....	....	....	91	82	9	87	70	17	86	73	13	78	62	16	56	46	10	6	4	2	2	2	....	....	....	....
Clifford, I.H...............warm	97	96	1	91	84	7	78	69	9	84	75	9	72	58	14	37	34	3	23	27	6	15	11	4	12	5	7
" I.H..................cool	....	....	....	95	90	5	88	73	15	89	67	22	80	71	9	76	66	10	35	18	17	34	28	6	43	33	10
Danish Chevalier, I.H ....warm	97	93	4	95	87	8	90	71	19	56	50	6	12	10	2	....	....	....	....	..	....	....	....	....	..	....	....
" I.H..........cool	....	....	...	88	83	5	83	57	26	80	73	7	44	40	4	29	27	2	1	1	..	1	1	....	....	....	....
French, I.H.................warm	93	91	2	86	69	17	77	64	13	48	35	13	12	10	2	3	3	....	....	....	....	...	....	....	....	....	....
" I.H...................cool	....	....	....	74	59	15	71	50	21	65	56	9	28	22	6	29	26	3	1	....	1	1	1	....	1	1	....
Gordon, I.H...............warm	94	93	1	91	88	3	85	78	7	82	76	6	57	49	8	22	19	3	15	10	5	7	6	1	2	1	1
" I.H...................cool	....	....	....	95	89	6	83	70	13	84	77	7	66	5	8	72	63	9	15	11	4	14	13	1	11	11	....
Invincible, I.H. ....warm	96	92	4	82	67	15	89	78	11	66	65	1	28	21	7	6	4	2	....	....	....	1	....	1	....	....	....
" I.H...............cool	....	....	....	94	85	9	83	61	22	79	69	10	59	45	14	48	38	10	4	3	1	....	....	....	...	....	....
Sidney, I.H.................warm	94	89	5	88	79	9	66	51	15	72	63	9	50	33	17	31	29	2	5	3	2	6	5	1	....	....	....
" I.H...................cool	....	....	....	91	87	4	85	74	11	82	78	4	83	75	8	75	60	15	29	17	12	10	9	1	14	12	2
Standwell, I.H..............warm	96	92	4	95	76	19	68	52	16	36	28	8	13	10	3	....	....	....	....	....	....	....	....	....	...	....	....
" I.H..................cool	....	....	..	91	85	6	90	60	30	79	75	4	61	50	11	50	38	12	4	1	3	1	1	....	....	....	....
Beaver, C.E.F...............warm	98	86	12	93	74	19	89	83	6	89	86	3	85	81	4	18	14	4	42	39	3	10	9	1	6	6	....
" C.E.F.................cool	....	....	....	93	88	5	94	81	13	96	78	18	95	84	11	84	78	6	39	32	7	17	16	1	....	....	....

Peas.	Jan., 1903.			March, 1904.			March, 1905.			March, 1906.			March, 1907.			Feb., 1908.			March, 1909.			March, 1910.			March, 1911.		
	Total.			Total.			Total.			Total.			Total.			Total.			Total.			Total.			Total.	Strong.	Weak.
Agnes, I.H. ....warm	98	....	....	98	....	....	100	....	....	100	....	....	60	....	....	62	....	....	74	....	....	32	....	....	18	16	2
" I.H. ....cool	....	....	....	100	....	....	100	....	....	86	....	....	52	....	....	98	....	....	76	....	....	76	....	....	62	34	28
Arthur, I.H. ....warm	96	....	....	92	....	....	94	....	....	98	....	....	48	....	....	76	....	....	98	....	....	14	....	....	24	12	12
" I.H. ....cool	....	....	....	94	....	....	88	....	....	78	....	....	64	....	....	100	....	....	50	....	....	66	....	....	16	10	6
Black-eye Marrowfat ....warm	96	....	....	94	....	....	86	....	....	66	....	....	30	....	....	8	....	....	14	....	....	....	....	....	....	....	....
" " I.H. ....cool	....	....	....	94	....	....	100	....	....	90	....	....	28	....	....	66	....	....	20	....	....	10	....	....	2	....	2
Carleton, I.H. ....warm	98	....	....	84	....	....	80	....	....	76	....	....	64	....	....	6	....	....	28	....	....	2	....	....	....	....	....
" I.H. ....cool	....	....	....	92	....	....	72	....	....	78	....	....	58	....	....	70	....	....	38	....	....	14	....	....	8	6	2
Crown, I.H. ....warm	100	....	....	98	....	....	100	....	....	98	....	....	92	....	....	48	....	....	32	....	....	2	....	....	10	8	2
" I.H. ....cool	....	....	....	100	....	....	94	....	....	100	....	....	92	....	....	98	....	....	84	....	....	38	....	....	24	14	10
Dan O'Rourke, I.H. ....warm	100	....	....	94	....	....	94	....	....	92	....	....	60	....	....	38	....	....	12	....	....	8	....	....	2	....	2
" " I.H. ....cool	....	....	....	98	....	....	100	....	....	94	....	....	92	....	....	74	....	....	54	....	....	56	....	....	18	6	12
Early Britain, I.H. ....warm	100	....	....	86	....	....	80	....	....	82	....	....	88	....	....	48	....	....	40	....	....	4	....	....	8	6	2
" " I.H. ....cool	....	....	....	92	....	....	100	....	....	92	....	....	90	....	....	76	....	....	78	....	....	46	....	....	40	32	8
Golden Vine, I.H. ....warm	100	....	....	96	....	....	92	....	....	74	....	....	86	....	....	30	....	....	4	....	....	2	....	....	....	....	....
" " I.H. ....cool	....	....	....	100	....	....	100	....	....	96	....	....	94	....	....	92	....	....	50	....	....	42	....	....	42	30	12
Macoun, I.H. ....warm	94	....	....	72	....	....	44	....	....	54	....	....	66	....	....	18	....	....	2	....	....	10	....	....	2	....	2
" I.H ....cool	....	....	....	80	....	....	80	....	....	72	....	....	44	....	....	84	....	....	22	....	....	8	....	....	2	2	....
Mummy, I.H. ....warm	96	....	....	96	....	....	88	....	....	90	....	....	46	....	....	24	....	....	18	....	....	10	....	....	4	2	2
" I.H. ....cool	....	....	....	98	....	....	88	....	....	96	....	....	84	....	....	94	....	....	18	....	....	16	....	....	12	10	2
Perth, I.H. ....cool	....	....	....	96	....	....	94	....	....	90	....	....	86	....	....	84	....	....	32	....	....	24	....	....	22	10	12
Pride, I.H. ....cool	....	....	....	98	....	....	96	....	....	96	....	....	64	....	....	74	....	....	58	....	....	18	....	....	20	4	16
Bright, C.E.F. ....cool	....	....	....	76	....	....	96	....	....	72	....	....	52	....	....	62	....	....	28	....	....	22	....	....	4	2	2
Chancellor, C.E.F. ....cool	....	....	....	80	....	....	82	....	....	86	....	....	20	....	....	60	....	....	....	....	....	14	....	....	62	34	28
Crown, C.E.F. ....cool	....	....	....	94	....	....	98	....	....	92	....	....	54	....	....	68	....	....	46	....	....	42	....	....	26	12	14
Early Britain, C.E.F. ....cool	....	....	....	90	....	....	100	....	....	96	....	....	82	....	....	98	....	....	98	....	....	74	....	....	88	78	10
Harrison's Glory, C.E.F. ....cool	....	....	....	100	....	....	88	....	....	84	....	....	58	....	....	82	....	....	16	....	....	16	....	....	40	16	24

WHEAT—Summary of Tests.

Year.	Kept Warm. Highest Percentage Vitality. Variety.	p. c.	Kept Cool. Highest Percentage Vitality. Variety.	p. c.	Kept Warm. Lowest Percentage Vitality. Variety.	p. c.	Kept Cool. Lowest Percentage Vitality. Variety.	p. c.	Warm. Average Vitality. p. c.	Cool. Average Vitality. p. c.
1903.......... 1st year, warm.	Lakefield, C.E.F........	100			Dawn, I.H.............. Laurel, I.H............ Minnesota, 163, C.E.F... Plumper, I.H.....	92 92 92 92			95·44	
1904.......... 2nd year, warm. 1st year, cool.	White Russian, Br	96	Monarch, C.E.F. ...... American Bronze, C.E.F.	99 99	Wellman's Fife, Br.....	71	Stanley, Br.............	84	84·5	90·17
1905.... .... 3rd year, warm. 2nd year, cool.	White Russian, Br......	89	White Russian, Br......	94	Early Riga, I.H...	64	Dawn, I.H.............	66	77·5	84·39
1906........... 4th year, warm. 3rd year, cool.	White Russian, Br......	99	White Russian, Br......	96	Lakefield, C.E.F........	60	Dawn, I.H.............	77	79·61	86·84
1907........... 5th year, warm. 4th year, cool.	American Bronze, C.E.F.	89	Wellman's Fife, Br...... White Fife, Br...... ...	92 92	Lakefield, C.E.F........	43	McKendry's Fife, I.H...	61	68·61	80·61
1908........... 6th year, warm. 5th year, cool.	Monarch, C. E. F.......	58	Monarch, C.E.F.........	94	Red Fife, I.H..........	2	McKendry's Fife, I.H...	58	27·72	77·22
1909........... 7th year, warm. 6th year, cool.	Early Red Clawson, C.E.F.	61	Early Red Clawson, C.E.F.	69	Red Fife, I.H........... McKendry's Fife, I.H...	0 0	McKendry's Fife, I.H .. Lakefield, C.E.F........	1 1	21·5	28·77
1910........... 8th year, warm. 7th year, cool.	Early Red Clawson, C.E.F.	37	Early Red Clawson, C.E.F.	55	Laurel, I.H............. McKendry's Fife, I.H... Red Fife, I.H.......... Lakefield, C.E.F........ Minnesota 163, C.E.F.... Huron, C.E.F..........	0 0 0 0 0 0	McKendry's Fife........ Red Fife..............	0 0	.... 7·0	20·77

Wheat—Summary of Tests.—*Continued.*

Year.	Kept Warm. Highest Percentage Vitality. Variety.	p. c.	Kept Cool. Highest Percentage Vitality. Variety.	p. c.	Kept Warm. Lowest Percentage Vitality. Variety.	p. c.	Kept Cool. Lowest Percentage Vitality. Variety.	p. c.	Warm. Average Vitality. p. c.	Cool. Average Vitality. p. c.
1911. 9th year, warm. 8th year, cool.	American Bronze, C.E.F. Early Red Clawson, C.E.F.	5 5	Early Red Clawson, C.E.F.	44	Stanley, Br. White Russian, Br. Dawn, I.H. Early Riga, I.H. Laurel, I.H. McKendry's Fife, I.H. Red Fife, I.H. Lakefield, C.E.F. Minnesota 163, C.E.F. Monarch, C.E.F. Huron, C.E.F.	0 0 0 0 0 0 0 0 0 0 0	McKendry's Fife	0	.... 1·15	14·5

Oats.—Summary of Tests.

Year.	Kept Warm. Highest Percentage Vitality. Variety.	p. c.	Kept Cool. Highest Percentage Vitality. Variety.	p. c.	Kept Warm. Lowest Percentage Vitality. Variety.	p. c.	Kept Cool. Lowest Percentage Vitality. Variety.	p. c.	Warm. Average Vitality. p. c.	Cool. Average Vitality. p. c.
1903. 1st year, warm.	Banner, I.H.	97			Abundance, I.H. Columbus, I.H. Tartar King, I.H.	90 90 90	....	....	92·9	
1904. 2nd year, warm. 1st year, cool.	Golden Beauty, I.H.	93	Prolific Black Tartarian, C.E.F. Liberty, C.E.F. American Beauty, C.E.F. Brandon, C.E.F. Danish Island, C.E.F. Early Gotham, C.E.F. Goldfinder, C.E.F.	100 100 100 100 100 100 100	Thousand Dollar, I.H.	65	Thousand Dollar, I.H.	70	74·1	89·3
1905. 3rd year, warm. 2nd year, cool.	Black Beauty, I.H.	92	Banner, C.E.F.	98	Tartar King, I.H.	69	Tartar King, I.H.	53	78·7	80·1

1906......... 4th year, warm. 3rd year, cool.	Golden Beauty, I.H....	85	Brandon, C.E.F......... Danish Island, I.H..... Early Gothland, C.E.F. Liberty, C.E.F......... Prol. Blk. Tarta'n, C.E.F. Rennie's Prize White, C.E.F.	100 100 100 100 100 100	Mennonite, I.H.........	67	Tartar King, I.H......	60	77·8	83·3
1907............ 5th year, warm. 4th year, cool.	Black Beauty, I.H......	69	American Beauty, C.E.F.	98	Tartar King, I.H......	31	Thousand Dollar, I.H...	40	47·9	77·5
1908............ 6th year, warm. 5th year, cool	Danish Island, I.H.....	54	Danish Island, C.E.F.... Aitkens' Black, C.E.F..	97 97	Abundance, I.H... ...	31	Columbus, I.H.	56	40·1	78·2
1909............ 7th year, warm. 6th year, cool.	Danish Island, I.H.....	29	Rennie's Prize White, C.E.F.	68	Bavarian, I.H....	7	Abundance. I.H.. ..... Thousand Dollar, I.H... Tartar King, I.H.	21 21 21	19·8	40·95
1910............ 8th year, warm. 7th year, cool.	Danish Island, I.H.....	18	Rennie's Prize White, C.E.F.	77	Thousand Dollar, I.H...	0	Abundance, I.H.........	16	5·9	42·65
1911............ 9th year, warm. 8th year, cool.	Danish Island, I.H.....	8	American Beauty, C.E.F.	91	Abundance, I.H....... Banner, I.H........... Bavarian, I.H. .... Mennonite, I.H.	1 1 1 1	Thousand Dollar, I.H...	15	.... 3·2	45·1

SIX-ROW BARLEY—Summary of Tests.

1903............ 1st year, warm.	Baxter, I.H............ Champion, I.H.... ... Nugent, C.E.F.......... Odessa, C.E.F.......... Rennie's Improved, C.E.F. Stella, C.E.F... .... Yale, C.E.F.......	100 100 100 100 100 100 100	....	....	Oderbruch, I. H........	92	....	....	....97·87	
1904............ 2nd year, warm. 1st year, cool.	Baxter, C.E.F..........	100	Brome, C.E.F........... Odessa, C.E.F.......... Rennie's Improved, C.E.F.	100 100 100	Odessa, I.H...... ...	86	Mensury, I.H....... ...	86	93·88	96·31
1905............ 3rd year, warm. 2nd year, cool.	Rennie's Improved, C.E.F.	98	Rennie's Improved, I.H.. Baxter, C.E.F .... Brome, C.E.F........... Rennie's Improved, C.E.F.	100 100 100 100	Yale, I.H........... ..	78	Yale, I.H..............	86	89·69	94·06

Six-Row Barley—Summary of Tests—*Continued.*

Year.	Kept Warm. Highest Percentage Vitality. Variety.	p. c.	Kept Cool. Highest Percentage Vitality. Variety.	p. c.	Kept Warm. Lowest Percentage Vitality. Variety.	p. c.	Kept Cool. Lowest Percentage Vitality. Variety.	p. c.	Warm. Average Vitality. p. c.	Cool. Average Vitality. p. c.
1906. 4th year, warm. 3rd year, cool.	Rennie's Improved, C.E.F.	100	Claude, I. H.	100	Baxter, I.H.	75	Mensury, I.H.	83	88·67	93·25
1907. 5th year, warm. 4th year, cool.	Baxter, C.E.F. Rennie's Improved, C.E.F.	94 94	Claude, I.H. Baxter, C.E.F Rennie's Improved, C.E.F.	94 94 94	Trooper, I.H.	64	Stella, C.E.F.	79	79·88	88·88
1908. 6th year, warm. 5th year, cool.	Rennie's Improved, C.E.F.	83	Baxter, C.E.F. Nugent, C.E.F. Odessa, C.E.F.	98 98 98	Yale, I.H. Yale, C.E.F.	34 34	Yale, I.H.	73	53·19	88·38
1909. 7th year, warm. 6th year, cool.	Baxter, C.E.F	71	Baxter, C.E.F.	89	Yale, I.H.	30	Yale, I.H.	21	45·81	52·44
1910. 8th year, warm. 7th year, cool.	Baxter, C.E.F.	53	Baxter, C.E.F.	82	Stella, C.E.F.	2	Baxter, I.H. Champion, I.H.	21 20	22·38	42·94
1911. 9th year, warm. 8th year, cool.	Rennie's Improved, C.E.F.	39	Rennie's Improved, C.E.F.	78	Stella, C.E.F.	0	Baxter, I.H.	9	11·56	38·31

Two-Row Barley—Summary of Tests.

Year.	Kept Warm. Highest Percentage Vitality. Variety.	p. c.	Kept Cool. Highest Percentage Vitality. Variety.	p. c.	Kept Warm. Lowest Percentage Vitality. Variety.	p. c.	Kept Cool. Lowest Percentage Vitality. Variety.	p. c.	Warm. Average Vitality. p. c.	Cool. Average Vitality. p. c.
1903. 1st year, warm.	Canadian Thorpe	100	....	....	French Chevalier	93	....	....	96·2	
1904. 2nd year, warm. 1st year, cool.	Canadian Thorpe Danish Chevalier Standwell	95 95 95	Clifford Gordon	95 95	Invincible	82	French Chevalier	74	90·6	90·5

Two-Row Barley—Summary of Tests.—*Continued.*

1905 3rd year, warm. 2nd year, cool.	Canadian Thorpe.	99	Beaver, C.E.F.	94	Sidney	66	French Chevalier	71	82·0	85·2
1906. 4th year, warm 3rd year, cool	Beaver, C.E.F.	89	Beaver, C.E.F.	96	Standwell	36	Invincible Standwell	79 79	65·8	82·8
1907. 5th year, warm. 4th year, cool.	Beaver, C.E.F.	85	Beaver, C.E.F.	95	Danish Chevalier French Chevalier	12 12	French Chevalier	23	42·3	68·0
1908. 6th year, warm. 5th year, cool.	Clifford	37	Beaver, C.E.F.	84	Danish Chevalier Standwell	0 0	Danish Chevalier French Chevalier	29 29	14·9	58·6
1909. 7th year, warm, 6th year, cool.	Beaver, C.E.F.	42	Beaver, C.E.F.	39	Danish Chevalier French Chevalier Invincible Standwell	0 0 0 0	Danish Chevalier French Chevalier	1 1	12·7	14·1
1910. 8th year, warm. 7th year, cool.	Clifford	15	Clifford.	34	Beaver, I.H. Danish Chevalier Standwell	0 0 0	Beaver, I.H. Invincible	0 0	4·0	7 9
1911. 9th year, warm. 8th year, cool.	Clifford	12	Clifford	43	Beaver, I.H. Canadian Thorpe Danish Chevalier French Chevalier Invincible Sidney Standwell	0 0 0 0 0 0 0	Ca. Thorpe Danish Chevalier Invincible Beaver, I.H.	0 0 0 0	2·0	7·4

Peas—Summary of Tests.

1903. 1st year, warm.	Crown, I.H Daniel O'Rourke Early Britain, I.H. Golden Vine	100 100 100 100	.....	....	Macoun	94	.....	....	97·8	
1904. 2nd year, warm. 1st year, cool.	Agnes Crown, I.H.	98 98	Agnes Crown, I.H. Golden Vine Harrison's Glory Golden Vine	100 100 100 100 100	Macoun	72	Bright	76	91·0	93·06

PEAS—Summary of Tests—*Continued.*

Year.	Kept Warm.		Kept Cool.		Kept Warm.		Kept Cool.		Warm.	Cool.
	Highest Percentage Vitality.		Highest Percentage Vitality.		Lowest Percentage Vitality.		Lowest Percentage Vitality.		Average Vitality.	Average Vitality.
	Variety.	p. c.	Variety.	p. c.	Variety.	p. c.	Variety.	p. c.	p. c.	p. c.
1905. 3rd year, warm. 2nd year, cool.	Agnes Crown, I.H	100 100	Agnes Black-eye Marrowfat Daniel O'Rourke Early Britain, I.H. Early Britain, C.E.. F.	100 100 100 100 100	Macoun	44	Carleton.	72	85·8	92·71
1906. 4th year, warm. 3rd year, cool.	Agnes	100	Crown, I.H.	100	Golden Vine	74	Macoun Bright	72 72	83·0	88·12
1907. 5th year, warm. 4th year, cool.	Crown, I.H	92	Golden Vine	94	Black-eye Marrowfat	92	Chancellor	20	64 0	65 53
1908. 6th year, warm. 5th year, cool.	Arthur	76	Arthur	100	Carleton	6	Chancellor	60	35·8	81·18
1909. 7th year, warm. 6th year, cool.	Arthur	98	Early Britain	98	Macoun	2	Chancellor	0	32·2	45·18
1910. 8th year, warm. 7th year, cool.	Agnes	32	Agnes	76	Black-eye Marrowfat	0	Macoun		8·4	34·12
1911. 9th year, warm. 8th year, cool.	Arthur	24	Agnes Chancel or	62 62	Black-eye Marrowfat Carleton Golden Vine	0 0 0	Black-eye Marrowfat Macoun	2 2	....	28·67

VISITS TO THE BRANCH FARMS AND STATIONS.

The regular visits were paid during the year to all the branch Farms and Stations. At Charlottetown, P.E.I., where the Station was just being started, a stay was made of nine days, and during this time a great change was made in the appearance of the place. The work of the season was planned, new orchards of apples, pears, plums and cherries, an arboretum, forest belts and hedges planted, and alterations to the Superintendent's house and a new implement shed arranged for. Collections of ornamental trees and shrubs were set out and beds of perennial and annual flowering plants provided for.

On May 9th to 11th, a visit was made to Nappan, N.S., where the work in progress was gone over and that for the coming season planned. As the season was late in opening, it was not possible to do much work on the land at this early period.

VISITS TO THE WESTERN EXPERIMENTAL FARMS AND STATIONS.

On May 24, I left Ottawa for the west, going straight through to Rosthern, Sask., where much planning and planting was done by the 30th. Shelter belts were set out and new orchards planted which, however, owing to the unfavourable season, subsequently made a poor record. On leaving Rosthern, a visit was paid to Scott, Sask., where the site of the new Station was examined and the location of the buildings was decided on. The 2nd and 3rd of June were spent at Lacombe, Alta., where a good deal of planting was done and the appearance of the Station much improved. Lethbridge, Alta., was visited on the 4th and 5th, Indian Head, Sask., on the 7th and 8th, and Brandon, Man., on the 8th and 9th. The work on these latter Farms was all well advanced and everything was in good order and working satisfactorily. I arrived in Ottawa on June 12

SECOND VISIT TO THE WESTERN FARMS AND STATIONS.

On July 22nd, I left Ottawa for a second visit to the branch Farms and Stations in the west. The 25th and 26th were spent at Brandon, Man., where the crops were well advanced and gave promise of a good yield. Arriving at Indian Head, Sask., on the 26th, three days were spent on the Experimental Farm there. On the 27th and 28th, large picnics were held, when several thousand farmers had the opportunity of seeing the magnificent crops of grain which were then well in head, and of inspecting the barns and fields, also the plantations of forest and ornamental trees, the fruits, vegetables and flowers. All the visitors appeared to enjoy their outing immensely and were delighted with the opportunity of seeing so many new objects of interest. The weather was very enjoyable.

Two days were spent at Rosthern, Sask., where the unfavourable weather had produced discouraging results and rain was greatly needed. Lethbridge, Alta., was visited on the 8th and 9th of August, where everything was suffering very much from drought. Short visits were made to Salmon Arm, B.C., and Kamloops, and Agassiz, B.C., was reached on the 15th where the crops were looking well. After two days spent here, a continuous journey was made to Ottawa, arriving there on the 21st of August.

ADDITIONS TO AND CHANGES IN THE STAFF OF THE EXPERIMENTAL FARMS.

Mr. Gustave A. Langelier is the son of Chrysostome Langelier of Quebec. He was educated in both French and English in the Quebec colleges and early showed a taste for live stock, his first efforts being in poultry breeding. He, for some years, was quite prominent in poultry circles, winning many prizes in various breeds.

About 1900, he bought Stadacona Farm at Cap Rouge and established there herds of Ayrshire cattle, Yorkshire swine and a stud of Clydesdale horses. He has been very successful in his breeding and feeding operations with dairy cattle and Yorkshire swine especially, winning many prizes in all parts of the province of Quebec and some parts of the province of Ontario and in the United States. He also, during that time, made a specialty of growing a variety of oats and a variety of potatoes which were disseminated in considerable quantities from his farm.

When Stadacona Farm was purchased by the Dominion Government as an Experimental Station, he was appointed its Superintendent, on January 1, 1901.

Mr. R. E. Everest, B.S.A., Superintendent of the Experimental Station at Scott, Sask., is a graduate of the Ontario Agricultural College at Guelph. In addition to considerable experience in farming in Ontario, he has had two years' experience as foreman on the Experimental Station at Lacombe, where he has had an opportunity of familiarizing himself with the agricultural problems peculiar to the western provinces.

During the year we have lost the services of Mr. Jas. Murray, Superintendent of the Experimental Farm at Brandon, Man. During the time he has held the position of Superintendent, he has proved a very careful and accurate experimenter and observer and the results obtained in the crops grown on the Experimental Farm have been most creditable. His persistent work has also resulted in a considerable improvement in all parts of the work undertaken, including stock. His courteous bearing towards all with whom he had to do, resulted in most kindly feelings between the public and himself and his stay, although short, has been a benefit to the Farm and his leaving us at this time is a matter of much regret. The position he has accepted is one of much responsibility and we have no doubt that he will fill it to the satisfaction of his employers and of the public generally.

The farms have been fortunate in securing the services of Mr. W. C. McKillican as his successor. He was born and brought up on his father's farm and early acquired a taste for agriculture. He received his early training in the public schools and, after attending the High School at Vankleek Hill, Ont., entered the Ontario Agricultural College at Guelph, where he won several prizes for scholarship. In 1904, he took the second highest individual score in the students' judging competition at Chicago. On graduating with the degree of B.S.A., he received the appointment of representative of the Seed Branch in Alberta, which position he held for six years and was quite successful in the work under his charge, especially in the development of seed fairs, which rose from practically an unknown thing to a total of thirty-five in Alberta this past season. This work has given him an excellent opportunity of learning western conditions and of meeting western men, which will, without doubt, prove of great benefit to him in his present position.

Mr. W. W. Thomson, foreman of the Cultural and Rotation Work at the Experimental Farm at Indian Head, Sask., was born at Carberry, Man., and after a public school and business college training, entered the Manitoba Agricultural College in 1906, being a member of the pioneer class of that institution. During his four years'

course there, he held first-class honour standing each year and in his final year won, in addition, the university silver medal for the highest standing in general proficiency. Graduating in 1911 with the degree of Bachelor of Science in Agriculture, after holding the position of Assistant Managing Director of Agricultural Societies for Manitoba for a year, he was appointed to his present position.

During the year assistants were appointed to the Dominion Agriculturist, to the Dominion Horticulturist, to the Dominion Cerealist and to the Dominion Chemist.

Mr. O. C. White, B.S.A., assistant to the Dominion Agriculturist, was born in 1887 in the county of South Ontario. After the usual training in the public and high schools, he entered the Ontario Agricultural College, Guelph in 1906, where in his fourth year, he was a member of the stock judging team at Chicago, winning the gold medal on that occasion as the highest man on his college team.

Upon graduation in 1910, he was appointed to his present position.

Mr. T. G. Bunting, B.S.A., is a son of W. H. Bunting, the well-known fruit grower of St. Catharines, Ontario, and was brought up on his father's fruit farm in the Niagara district.

He graduated from the Ontario Agricultural College in June, 1907, as a specialist in horticulture. Since graduating, he has spent eight months on the Pacific coast, in California, Oregon, Washington and British Columbia, studying the fruit industry of that section. Since then, he has spent one year at home on a fruit farm and one year at the New Hampshire Agricultural College and Experiment Station as assistant in vegetable gardening. He severed his connection there in August, 1910, to accept his present position of assistant to the Dominion Horticulturist.

Mr. H. Sirett, B.S.A., assistant to the Dominion Cerealist, was born at Rousseau, Muskoka, in 1882. He was educated at the public schools and afterward at the Mount Forest high school. He entered the Ontario Agricultural College in the autumn of 1905, graduating in June, 1909.

At college he was the winner of the Governor General's medal for general proficiency for two years, 1905 and 1907, and graduated with first-class honours in chemistry and field husbandry.

For the year previous to accepting his present position, he was employed by the Ontario Department of Agriculture as district representative in the county of Carleton.

Mr. Edward Blake Carruthers, M.A., Assistant Chemist, was born at Lindsay, Ontario. He received his preliminary education at the Jamieson Ave., Collegiate Institute, Toronto, and matriculated in 1905 with first-class honours in every department, winning the Gibson Scholarship. He took his degree of B.A. in 1909, at Toronto University, with honours in the course of Chemistry and Mineralogy. He spent the following year as Instructor in Chemistry at Toronto University, taking the degree of M.A. in 1910.

He entered on his present position in the Chemistry Division at the Central Farm on August 1, 1910.

Mr. Clifford H. Robinson, Assistant Chemist, was born near Florence, Ontario, in 1888.

He received his preliminary education in the Collegiates of Chatham and Ridgetown. He entered Toronto University as the holder of the first Edward Blake Scholarship in Mathematics and Science, in the class of 1909, in the course of Chemistry and Mineralogy. He held the scholarships granted in this department in his first and third years, taking his degree of B.A. with first-class honours in 1909.

The following year was spent as Assistant in Chemistry at Toronto University. He entered the Chemical Division of the Experimental Farms on August 1, 1910.

Mr. A. T. Stuart, B.A., Assistant Chemist, was born in 1882, at Hamilton, Ontario. He attended the Hamilton public schools and Collegiate Institute. He entered Toronto University, with Honour Matriculation standing, in the class of

1906, in the course of Chemistry and Mineralogy. He was a fellow in Chemistry at the University in 1907 and 1908, and has since been employed as Chemist with various manufacturing companies including the International Harvester Co., The Canada Iron Furnace Co., The National Electrolytic Co., The Acker Process Co., and the Potash Syndicate Co. He was appointed to his present position on August 1, 1910.

ACKNOWLEDGMENTS.

I acknowledge, with a deep sense of indebtedness, the services of all the members of the Experimental Farm staff for their kind co-operation in the various branches of the work conducted on all the Experimental Farms and Stations throughout the Dominion. The results given in the present report bear abundant evidence of their earnest endeavour to render such service in their several spheres of labour as will stimulate the progress of agriculture. I also tender sincere thanks to those members of the staff who have aided me in those branches of the work of which I have had personal charge:—To the foreman in charge of the lawns and ornamental grounds at the Central Farm for the taste and industry which he has displayed and to the foreman of the greenhouse for his careful management of the plants and shrubs under propagation, also for the useful work he has done in testing the vitality of seeds and in the taking of meteorological records. I also desire to bear testimony to the valuable services rendered me by my assistant and to the faithful work done by my secretary. The employees of all the Farms have also my thanks for the interest they have manifested in their work and for the careful manner in which they have discharged their respective duties.

REPORT OF

THE DOMINION AGRICULTURIST

J. H. GRISDALE, B. AGR.

OTTAWA, March 31, 1911.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision on the Central Experimental Farm during the past year.

I have to report a very successful year in the different lines of work in my Division.

Weather conditions in 1910 were probably quite up to the average as favouring crop production in this part of Canada. The reports of the different fields show the beneficial effects of such weather by increased crop returns as compared with such dry years as were 1906, 1907 and 1908.

The enlargement of my position from Agriculturist at the Central Experimental Farm to Dominion Agriculturist in charge of Agriculture and Live Stock work on all the branch Experimental Farms and Stations as well as on the Central Experimental Farm has necessarily meant more frequent and more prolonged absences from this Farm. One result has been a somewhat smaller amount of experimental work with live stock during the past year. As readjustment gradually takes place, it is hoped, however, that more, rather than less, investigational work, not only at Ottawa but on all the Branch Farms and Stations, may be got under way, and consequently the usefulness of this Division relatively increased.

The added work consequent upon the extension of my supervisory duties made the appointment of an assistant to the Dominion Agriculturist most necessary. Mr. O. C. White was named to this position in June, 1910, and has proven most capable and painstaking in every way. I am deeply indebted to him for much assistance in both office and outside work.

Mr. D. D. Gray, Farm Foreman, during the past year has had almost complete charge of the field work. My frequent long absences have made it more and more necessary to put all note-taking and reporting on results into his hands. I am glad to be able to say that the added work has been done exceedingly well and most cheerfully. Mr. Gray has, in addition, had charge of the pigs during the past two years with most gratifying results as witness the brief financial statement in the text of the attached report.

In the preparation of this report, Mr. White, my Assistant, and Mr. Gray, Farm Foreman, have done practically all the work, as my other duties have been such as to effectully prevent my doing anything more than exercise a more or less close supervision and offer suggestions as to methods of presenting results.

To Mr. Giguere, my Secretary, I am especially indebted for most intelligent cooperation in working out plans for experimental work on Branch Farms and Stations,

and for untiring and willing extra effort whenever necessary, as has been frequently the case during the past year.

Mr. Meilleur during the past year has, under my supervision, found it possible to introduce some new lines of work in our dairy here. Some brief paragraphs will be found dealing with this branch of dairying, in the body of my report.

I am sorry to have to report another change of herdsman, the present herdsman, Mr. J. Haining, having relieved Mr. Gibson in September last.

During the year I have attended a large number of meetings, assisted at various short courses and judged live stock at some of the principal fairs in various parts of Canada, in addition to my regular duties as Dominion Agriculturist.

From April 1, 1910, to March 31, 1911, 3,915 letters were received and 6,218 despatched by the Agricultural Division.

I have the honour to be, sir,

Your obedient servant,

J. H. GRISDALE,

Dominion Agriculturist.

LIVE STOCK.

The live stock now (April 1, 1911) occupying the different stables and pens under my charge include horses, cattle, sheep and swine.

HORSES.

The horses are kept for labour exclusively, although some experimental feeding is usually under way to gain some information as to the most economical methods of feeding work horses, as well as experiments to determine the comparative values of different foods as forage for same.

The horses are eighteen in number, made up at present of:—

Thirteen heavy horses of Clydesdale and Percheron blood.

Four heavy driving horses.

One light driver.

CATTLE.

There are representatives of five breeds of cattle, namely: Shorthorn, Ayrshire, Guernsey, Canadian and Holstein. There are, besides, a number of grade cattle and steers. The cattle are kept for breeding and feeding operations, mostly of an experimental character. Pure-bred breeding animals are usually on sale, however, and a considerable number are sold in the course of the year.

Pure Bred Breeding Cattle.

The pure-bred cattle in the barn at present are as follows:—

Twenty-eight Shorthorns, including 4 bulls and 24 females.

Thirty-seven Ayrshires, including 5 bulls and 32 females.

Twenty-two Guernseys, including 3 bulls and 19 females.

Twenty-eight Canadians, including 5 bulls and 23 females.

Two Holsteins, including 1 bull and 1 female.

Grade Cattle.

The grades number 22 head, made up of:—

Six Shorthorn grades, 5 Ayrshire grades, eight Guernsey grades and 3 Canadian grades.

Steers.

Nineteen steers are under feed at present. They are of different ages and breeding, and their number is made up of 1 calf and 18 yearlings.

SHEEP.

There are now 68 pure-bred sheep in the pens. Two breeds are kept, namely: Shropshire and Leicester.

There are 50 Shropshires, as follows: 19 aged ewes, 4 yearling ewes, 8 yearling rams, 12 spring ewe lambs and 7 spring ram lambs.

There are 18 Leicesters, as follows: 7 aged ewes, 3 yearling ewes, 5 spring ewe lambs, 2 spring ram lambs and one breeding ram.

Besides the above pure-breds there are 20 mixed grade wethers.

SWINE.

One hundred and seventy-four swine of all classes are now in the pens, being fed experimentally, or being kept for breeding purposes. The breeds kept are Berkshire, Yorkshire and Tamworth.

The Yorkshires are 100 in number, including 2 stock boars, 33 breeding sows, 11 young sows, 40 young pigs and 14 feeders.

The Berkshires are 30 in number, including 2 stock boars, 18 brood sows, 4 young sows and 6 young pigs.

The Tamworts are 44 in number, including 2 stock boars, 13 breeding sows, 8 young sows, 12 young pigs and 9 feeders.

HORSES.

There are usually 19 horses in the stables. These horses are expected to do the work in the various divisions during the year. The work on the '200-acre farm' is but a part of their duties. They work in addition for the Horticultural and Cereal Divsions, as well as upon the lawns and in the arboretum. In addition, a large amount of hauling or cartage in connection with the different divisions, as well as road making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year, from April 1, 1910, to March 31, 1911, the work done by the horses kept in the stables here was equivalent to 5,638·6 days' work, distributed as follows: Live stock, hauling feed, marketing stock, etc., 136·7 days; farm work, '200-acre form,' 841·6 days; draining and care of roads, including removing snow and breaking roads in winter, 171·8 days; manure on '200-acre farm,' 368 days; Horticultural Division, 761·9 days; Cereal Division, 645·5 days; lawns, etc., 185·6 days; bulletins and reports, from and to farm offices, 105·1 days; poultry, 40·4 days; mail, and milk delivery, 57·5 days; omnibus service, including one horse for omnibus, two horses for general driving, and one horse for supervision of work, 1,460 days; work about greenhouse, outbuildings, sidewalks, exhibitions, etc., 703 days; arboretum, 161·5 days.

FEEDING THE WORK HORSES.

The horses here are fed by one man. Each teamster is responsible for the cleaning of his horses and harness, but has nothing to do with the feed.

Generally speaking, the horses are fed on mixed hay, given long, oats and bran, about 5 parts of whole oats to 2 parts of bran. These two are mixed and fed dry. On Saturday nights a bran mash of 5 or 6 lbs. per horse takes the place of the regular oat and bran mixture. When horses are on very heavy work, the ratio between oats and bran is usually changed to 5 of oats and 1 of bran. The horses receive from 1 to 1¼ lbs. of the oat and bran mixture and about 1 lb. of hay a day for each 100 lbs. of their weight. That is to say, a 1,600-lb. horse would get from 16 to 20 lbs. of grain mixture and about 16 lbs. of hay each day. The amount of grain or grain mixture fed depends upon the work being performed. The harder the work, the larger the amount of meal fed. That is, of course, subject to change, according to the health of the animals and various other minor considerations, such as degree of fatigue at night, temperature, etc.

The feeding of the horses follows regular lines and is done at regular hours. The first feed for the day is given at 5 a.m. It consists of about three-eighths of the total amount of meal or grain mixture to be fed during the day and about one-quarter of the hay. The noon feed is about the same thing. The evening feed consists of about one-quarter or two-eighths of the meal or grain mixture for the day and about one-half the hay.

Water is given between 6 and 7 in the morning, at noon, at 6 o'clock, or as the horses come in from work, and in winter at about 8 p.m. The water is given at 8 o'clock at night in the winter for the reason that the horses come in an hour earlier at night and go out an hour later in the morning.

DAIRY CATTLE.

The herd of dairy cattle during the year 1910-11 consisted of 75 milch cows all told. They were:—

Ayrshires	21
Guernseys	11
Canadians	15
Shorthorns	14
Grades (various breeding)	14

FEEDING THE DAIRY COWS.

The year 1910-11 has been a very satisfactory year from the dairy farmers' point of view. Grass started fairly early in the spring, and continued good throughout the remainder of the year, the fall months especially being very moist.

SUMMER FEEDING.

As during the previous four years, the dairy cattle were allowed only a small area for pasture. They depended for the most part upon soiling crops and corn silage. As pasture there was available only eighteen acres. Fourteen acres of this had been seeded down the previous year with a mixture per acre of, Red clover 10 lbs., Alfalfa 6 lbs., Alsike, 2 lbs. and Timothy 6 lbs. This seeding made such a strong growth in late May and early June that it was considered advisable to pasture only six acres, and to cut the remainder for soiling purposes. Four acres were seeded down in the spring to an annual pasture mixture of 60 lbs. oats, 25 lbs. sorghum, 5 lbs. Red clover and 20 lbs. vetches. This mixture made rapid growth, and proved very acceptable to the cows.

For August, provision had been made by holding over a supply of corn ensilage. This material was fed more or less every day during the summer. During August, however, it formed the staple part of the ration. In September, grass was again plentiful, so very materially lessened the quantity of forage required to supplement the grass.

Practically all farmers require more or less feed to supplement pasture grass, unless the area down to grass is, relative to the number of cows, very large. Corn silage is, no doubt, for most parts of Canada, the best forage to use for such a purpose.

In many cases, however, silos are not yet in use, and for such farmers a good plan would be to make use of the information contained in a 'Notice' or leaflet of instruction sent out very widely from this Division the last few years, a copy of which appears below.

NOTICE FROM THE EXPERIMENTAL FARM TO DAIRY FARMERS.

Every year every dairy farmer loses much money on account of the scarcity of grass or by reason of the unprofitably large area of land that has to be used to insure good pasture during the months of July and August.

If the average dairy herd is to be profitable, every cow must be kept up to her full capacity during those two months, as well as during the preceding and succeeding months.

The quantity of milk produced during September, October and November is very materially influenced by the way in which the cattle are fed in July and August.

Cows receiving insufficient food during those two months naturally decrease very rapidly in milk flow. Once the milk yield is materially decreased for any considerable length of time, it cannot during that season be again brought up to what it might otherwise have been.

Hence, although pastures are usually good or feed plentiful during the months of September, October and November, when prices for cheese and butter are high, we must, in order to get the full benefit of these high prices and abundant supplies of feed, have been feeding well during the months of July and August.

The cheapest, easiest and most certain plan of insuring an abundance of food during the months of July and August is to make use of soiling crops.

Experiments at the Experimental Farm as well as elsewhere would seem to indicate vetches, peas, oats, clover and corn as the most suitable crops for the purpose.

For 10 Cows.

Dairy farmers are, therefore, recommended to prepare and feed somewhat as follows for each 10 cows in their herds:—

1. Clover, 1 acre—To have been sown with the mixture of peas and oats the previous year as described below.

Feed off June 20 to July 15.

2. Peas and oats, ½ acre—Sow 1 bushel peas, 1½ bushel oats and 5 lbs. red clover seed on one half-acre of land about the first week in May, or earlier if possible.

Feed off July 15 to 31.

3. Peas and oats, ½ acre—Sow same mixture on another half-acre about third week in May.

Feed off August 1 to 15.

4. Corn, ½ acre.—Sow 10 lbs. Longfellow corn (or other small variety) in hills 3 feet apart each way. Sow third week in May or as early as possible. Sow on well drained land, clover sod manured at rate of 20 loads (tons) per acre.

Feed off August 15 to 30.

5. Corn, ½ acre.—Sow 12 lbs. Leaming (or other medium variety) same way as above.

Feed off in September.

WM. SAUNDERS,
Director.

J. H. GRISDALE,
Agriculturist.

WINTER FEEDING.

The winter feeding was carried on under quite as favourable conditions as the summer. Feed was plentiful and of good quality. Cattle entered the barns in good flesh and have done well.

The winter ration has been on the average about as follows:—

Hay	5 lbs.
Corn ensilage	30 lbs.
Roots	10 lbs.
Straw	4 lbs.
Meal	7 lbs.

The hay was mixed red clover and timothy. The corn silage was of good quality, rich in grain and well preserved.

The roots were mangels, sugar mangels, sugar beets and turnips. They were usually pulped and mixed with the ensilage.

The straw was, of course, oat and was of good feeding quality. It was cut and mixed with the pulped roots and ensilage.

The meal usually consisted of a mixture of 800 lbs. bran, 300 lbs. gluten and 200 lbs. oil-cake meal.

The meal was scattered on the roughage mixture of roots, ensilage and cut straw after it was before the cattle. The hay given was fed uncut, after the other material had been cleaned up.

Of course the amount of roughage fed depends on the appetite of the cow; the amount of meal is influenced rather by the amount of milk being produced by the cow in question.

Her meal ration is gradually increased after calving until at three or four weeks in milk she is supposed to be on full feed. The amount of meal is judged by the milk produced. If she responds freely to the increases in meal, she is fed the more liberally, usually up to that point where an increase in meal does not seem to induce a relatively liberal increase in milk flow. One pound of meal for four pounds of milk is liberal feeding; one pound of meal for three pounds of milk, to leave a profit, necessitates selling milk at a higher price than the average farmer may hope for. In this connection it may be observed that the quality or composition of the meal ration is usually an important factor affecting the milk yield. It is exceedingly important, however, to remember that palatability in the meal as well as in the roughage is an influence that is not infrequently underestimated. Variety in meals fed is advisable, but variety should mean a blending of meals, not a substitution of one for another at frequent intervals. To illustrate, it is much better to feed a mixture of bran, oats, barley, oil-meal, gluten, cottonseed meal, etc., than to feed any one of them for a time, to be subsequently replaced by some other.

Generally speaking, the meal ration for dairy cows should be rich in protein, palatable, easily digested and fairly finely ground and blended to suit the roughage ration with which it is fed. Meals vary greatly as to composition and effect upon the digestive organs of the cattle. While some are laxative, some are constipating in effect, and while some seem to develop appetite, others have the opposite tendency.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during the season 1910, save in the case of ensilage and roots, which are charged for at the rate usually affixed in the experimental feeding in all parts of America.

Pasture per month	$ 1 00	per cow
Bran	20 00	per ton
Gluten meal	28 00	"
Oil meal	35 00	"
Oats	25 00	"
Barley	22 00	"
Clover hay	7 00	"
Chaff	4 00	"
Roots and ensilage	2 00	"

In estimating the value of the product, 26 cents per pound is allowed for the butter and 20 cents per 100 lbs. for the skim milk. The butter sells at from 25 to 35 cents per pound.

DAIRY HERD RECORDS.

The Central Experimental Farm dairy herd records as given below make a moderate showing. Where cattle are soiled, the cost of feeding during the summer months is, of course, increased, since more labour is necessary.

Records are given for cows that have milked for a sufficiently long time during the year to give a fair indication of their ability as producers. A number of heifers that calved just shortly before the thirty-first day of March, and a few cows that were sold soon after the beginning of the fiscal year are, therefore, not reported upon.

Name of Cows.		[illegible]	Date of Dropping last Calf.	Number of Days in Milk.	Daily Average Yield in Milk.	Total Milk for Period.	Per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 26c. per pound.	Value of Skim Milk at 20c. per cwt.	Total Value of Product.	Amount of Meal eaten, at 1¼c. per pound.	Amount of Roots and Ensilage eaten, at $2 per ton.	Amount of Hay eaten, at $7 per ton.	Amount of Straw eaten, valued at 20c. per cwt.	Months on Pasture, at $1 per month.	Total Cost of Feed for Period.	Cost to Produce 100 lbs. of Milk.	Cost to Produce 1 lb. of Butter, Skim Milk neglected.	Profit on 1 lb. Butter, Skim Milk neglected.	Profit on Cow during Period, Labour neglected.
					Lbs	Lbs.	p. c.		$	$	$	Lbs.	Lbs.	Lbs.	Lbs.	No.	$	Cts.	Cts.	Cts.	
Alma	G.G.	1[illegible]	Aug. 15, '10	282	24·9	7,034	4·70	389·27	101.21	13.29	114.50	1,955	10,647	5,453	1,066	4	60.30	85·7	15·8	10·2	54·20
Flavia	A.	9	Mar. 25, '11	292	31·4	9,168	3·76	406·24	105.62	17.71	123.33	2,613	11,097	5,691	1,220	4	70.12	76·5	17·2	8·8	53·21
Dora	G.G.	8	May 7, '10	235	19·7	6,493	5·15	393·14	102.22	12.20	114.42	2,163	10,049	5,673	998	4	62.95	97·0	16·0	10·0	51·47
Inoquette	C.	7	Apr. 28, '10	284	25·8	7,339	4·39	379·38	98.64	13.92	112.56	2,129	10,407	5,816	1,039	4	63.46	86·5	16·7	9·3	49·10
Ottawa Itchen	G.	5	Nov. 25, '10	296	20·2	5,988	5·12	361·09	93.88	11.25	105.13	1,721	16,322	5,560	1,038	4	57.36	95·8	15·9	10·1	47·77
Flavia II	A.	5	Jan. 6, '11	263	27·7	7,276	4·28	366·60	95.31	13.82	109.13	1,874	11,890	5,700	1,132	4	61.52	84·5	16·7	9·3	47·61
La Belle	C.	6	Mar. 17, '10	329	21·0	6,895	4·53	367·61	95.58	13.05	108.63	2,277	9,708	5,358	905	4	62.73	90·9	17·1	8·9	45·90
Denty IV	A.	4	Mar. 21, '11	283	27·7	7,829	3·91	360·20	93.65	14.94	108.59	2,179	10,745	5,714	1,067	4	64.12	81·9	17·8	8·2	44·47
Rejane, 2ème d'Ottawa	C.	4	Nov. 21, '10	317	17·7	5,598	5·34	351·58	91.41	10.49	101.90	1,884	9,835	5,339	997	4	58.07	104·0	16·5	9·5	43·83
Maggie of C	A.	13	June 4, '10	298	30·5	9,091	3·38	362·19	94.16	17.45	111.61	2,664	10,667	5,700	1,157	4	70.22	77·2	25·1	·9	41·39
Illuminata III	S.	7	Nov. 25, '10	327	26·2	8,555	3·77	379·74	98.73	8.18	106.91	2,314	10,827	5,890	1,096	4	66.57	77·8	17·5	8·5	40·34
Marjorie II	A.	5	Sept. 5, '10	251	27·2	6,829	4·26	342·22	88.98	12.97	101.95	1,916	11,250	5,816	1,202	4	61.96	90·7	18·1	7·9	39·99
Ottawa Kate	A.	4	Dec. 23, '10	335	22·3	7,457	3·83	335·93	87.34	14.24	101.58	2,196	9,689	5,410	1,060	4	62.20	83·4	18·5	7·5	39·38
Queenie	G.G.	13	Apr. 24, '10	340	13·7	4,654	6·11	334·55	86.98	8.64	95.63	1,746	9,978	5,709	1,031	4	57.85	124·0	17·2	8·8	37·78
Gurta II	G.A.	3	July 27, '10	304	20·6	6,264	4·25	313·49	81.50	11.90	93.40	1,784	9,842	5,161	1,017	4	56.23	89·8	17·9	8·1	37·17
Marjorie	A	9	Mar. 20, '11	270	30·0	8,113	3·44	327·82	85.23	15.57	100.80	2,291	11,169	5,723	994	4	65.83	81·0	20·1	5·9	34·97
Fanny	G...C.	6	Feb. 8, '10	365	16·4	6,004	4·31	304·41	79.15	11.40	90.55	1,799	9,437	5,532	954	4	57.20	95·3	18·8	7·2	33·35
Fortune 4ème	C.	4	Feb. 15, '10	344	18·3	6,287	4·24	313·85	81.60	11.95	93.55	2,122	9,789	5,412	966	4	61.19	97·3	19·5	6·5	32·36
Marjorie IV	A.	3	Nov. 17, '10	132	24·0	3,172	4·07	151·82	39.47	6.04	45.51	673	3,606	710	350	....	15.20	47·9	10·0	16·0	30·31
Denty III	A.	5	May 16, '10	316	20·4	6,435	4·13	312·61	81.28	12.24	93.52	2,165	10,598	5,724	1,036	4	63.75	99·1	20·4	5·6	29·77
Aromaz	C.	3	Mar. 28, '11	329	15·8	5,204	4·92	300·98	78.25	9.81	88.06	1,871	9,116	6,100	956	4	59.77	115·0	19·8	6·2	28·29
Duchess III	S.	3	Oct. 26, '10	155	21·8	3,386	4·51	178·60	46.44	6.41	52.85	1,101	6,252	1,276	574	....	25.93	76·6	14·5	11·5	26·92
Zamora	C.	15	Nov. 13, '10	350	14·4	5,040	4·97	294·79	76.65	9.49	86.14	1,847	10,368	5,747	977	4	59.52	118·0	20·2	5·8	26·62
Ottawa Marchioness IV	S.	2	Nov. 21, '10	130	24·2	3,140	4·33	159·96	41.59	5.96	47.55	937	5,270	1,016	437	....	21.41	68·2	13·4	12·6	26·14
Denise Duchesse	C.	7	Apr. 17, '10	346	18·3	6,342	3·95	294·85	76.66	12.09	88.76	2,234	9,733	5,451	1,000	4	62.74	98·9	21·3	4·7	26·01
Dona Clatina	G.	4	Sept. 14, '10	350	12·7	4,448	5·39	282·19	73.37	8.33	81.70	1,774	9,177	5,395	960	4	56.16	126·0	19·9	6·1	25·54
Alice	G.A.	3	Dec. 7, '10	110	22·6	2,482	4·81	140·52	36.53	4.68	41.21	696	3,661	792	320	....	15.77	63·5	11·2	14·8	25·44
Denty	A.	12	July 2, '10	369	23·7	6,362	3·77	282·68	73.50	12.16	85.66	1,975	11,022	5,520	1,180	4	61.38	96·4	21·7	4·3	24·27
Soncy of Nappan	A.	5	Mar. 28, '10	356	19·2	6,831	3·56	286·40	74.46	13.09	87.55	2,248	9,671	5,579	943	4	63.29	92·7	22·1	3·9	24·26
Pearly Prize	G.	6	Mar. 15, '11	321	14·6	4,700	5·11	282·65	73.49	8.83	82.32	1,820	9,846	5,601	990	4	58.18	124·0	20·6	5·4	24·14
Janet	S.	11	Mar. 5, '11	265	21·7	5,755	4·17	282·58	73.47	10.94	84.41	1,823	10,955	5,786	1,180	4	60.34	105·0	21·4	4·6	24·07
Maggie 10th	A.	3	Nov. 24, '10	124	25·9	3,211	3·93	148·47	38.60	6.13	42.84	897	4,511	906	405	....	19.70	61·4	13·3	12·7	23·14

Dolly ..................G.A.	8	Mar. 25, '10....	275	24·9	6,835	3·56	286·05	74·37	13·10	87.47	2,493	10,581	5,613	970	4	65.33	95·6	22·8	3·2	22·14
Alma II. ..............G.G.	5	Aug. 28, '10....	303	15·4	4,679	4·91	270·38	70·30	8·82	79.12	1,737	9,756	5,682	1,013	4	57.39	123·0	21·2	4·8	21·73
Maggie 5th ....A.	5	May 20, '10....	254	22·4	5,702	3·85	258·48	67·20	10·89	78·09	1,767	9,671	5,479	1,029	4	56.99	99·9	22·0	4·0	21·10
Inoquette III..................C.	2	Jan. 8, '10....	365	12·9	4,700	4·63	256·20	66·61	8·89	75·50	1,749	9,103	5,152	957	4	54.90	117·0	21·4	4·6	20·60
Ottawa Lass..................S.	9	Feb. 21, '10....	365	17·5	6,384	3·73	280·44	72·91	12·21	85·12	2,170	10,836	5,912	1,102	4	64.89	102·0	23·1	2·9	20·23
Itchen Lady ....G.	13	Mar. 14, '11....	214	21·9	4,700	4·07	259·88	67·57	8·88	76.45	1,812	9,492	5,638	960	4	57.79	123·0	22·2	3·8	18·66
Soncy R. ....A.	6	Nov. 15, '10....	314	15·8	4,959	4·11	239·49	62·27	9·44	71.71	1,633	9,342	5,138	1,017	4	53.76	108·0	22·4	3·6	17·95
Illuminata 5th..................S.	4	Oct. 31, '10....	231	18·1	4,174	3·90	191·48	49·78	7·97	57.75	1,203	4,945	4,643	578	4	41.40	99·2	21·6	4·4	16·35
Archer's Spot..................G.	2	Dec. 27, '10....	79	18·3	1,448	5·29	90·05	23·41	2·72	26.13	509	2,700	540	224	....	11.40	78·7	12·7	13·3	14·73
Maggie Pulchrae..................A.	2	Dec. 3, '10....	105	19·8	2,080	4·11	100·52	26·14	3·96	30 10	713	3,611	726	320	....	15.70	75·5	15·6	10·4	14·40
Soncy III. ....A.	2	Sept. 21, '10....	182	14·7	2,677	3·79	119·57	31·08	5·11	36.19	956	5,305	1,146	500	....	22.26	83·1	18·6	7·4	13·93
Marjorie III ....A.	3	Feb. 24, '10	286	17·3	4,948	4·11	239·31	62·22	9·42	71.64	1,853	9,332	5,579	970	4	57.96	117·0	24·2	1·8	13·68
Ottawa Marchioness III.... S.	5	Aug. 8, '10....	256	17·9	4,587	4·17	224·82	58·45	8·72	67.17	1,800	10,192	4,486	962	4	54.31	118·0	24·2	1·8	12·86
Fortune Précoce..................C.	4	Mar. 6, '11....	287	18·1	5,187	4·00	231·84	60·28	9·91	70.19	1,926	9,217	5,268	935	4	57.61	111·0	24·8	1·2	12*58
Jessie E. ....A.	10	Aug. 30, '10....	251	19·3	4.836	3·77	214·39	55·74	9·24	64.98	1,504	9,700	5,200	987	4	52.67	109·0	24·6	1·4	12·31
Jessica of Elmhurst III......S.	3	Sept. 15, '10....	224	19·5	4,356	4·19	214·64	55·81	8·28	64.09	1,373	9,848	5,400	1,038	4	51.99	119·0	24·2	1·8	12·10
Fortune d'Oka..................C.	14	Apr. 2, '10....	280	15·8	4,420	4·14	215·14	55·94	8·41	64.35	1,659	8,265	5,196	869	4	52.94	120·0	24·6	1·4	11·41
Ottawa Marchioness II......S.	6	Dec. 4, '10....	275	18·3	5,029	3·99	236·31	61·44	9·59	71.03	1,878	10,676	5,793	1,118	4	60.68	121·0	25·7	·3	10·35
Duchesse 5ème..................C.	4	Dec. 29, '10....	181	21·5	3,895	4·32	197·87	51·45	7·39	58.84	1,271	9,225	5,679	1,119	4	51.24	132·0	25·9	·1	7·60
Duchesse Perdue ....C.	5	June 6, '10....	313	14·6	4,562	3·96	212·72	55·31	8·70	64.01	1,810	9,377	5,386	965	4	56.79	124·0	26·7	*·7	7·22
La Poupée..................C.	8	Apr. 14, '10....	151	23·5	3,550	4·79	200·04	52·00	6·70	58.70	1,379	9,766	5,557	1,011	4	52 47	147·0	26·2	*·2	6·23
Whitie..................G.S.	7	Mar. 24, '11....	247	21·5	5,319	3·91	244·80	63·65	10·15	73.80	2,510	10,961	5,700	1,057	4	68.40	129·0	27·9	*1·9	5·40

* Loss.

Names of Cows.	Age.	Date of Dropping last Calf.	Number of Days in Milk.	Daily average Yield in Milk.	Total Milk for Period.	Per cent Fat in Milk.	Pounds of Butter produced in Period.	Value of Butter at 26 cents per Pound.	Value of Skim Milk at 20 cents per cwt.	Total Value of Products.	Amount of Meal eaten at 1¼ cents per lb.	Amount of Roots and Ensilage eaten at $2 per ton.	Amount of Hay eaten at $7 per ton.	Amount of Straw eaten valued at 20c. per cwt.	Months on Pasture at $1 per month.	Total cost of Feed for Period.	Cost to produce 100 lbs. of Milk.	Cost to produce 1 lb. Butter, Skim Milk neglected.	Profit on 1 lb. of Butter, Skim Milk neglected.	Profit on Cow during Period, Labour neglected.
	Yrs.			Lbs.	Lbs.	p.c.	Lbs.	$	$	$	Lbs.	Lbs.	Lbs.	Lbs.	Mos.	$	Cts.	Cts.	Cts.	
"CANADIANS."																				
Inoquette	7	Apr. 28, '10.	284	25·8	7,339	4·39	379·38	98.64	13.92	112.56	2,129	10,407	5,816	1,039	4	63·46	86·5	16·7	9·3	49·10
La Belle	6	Mar. 17, '10.	329	21·0	6,895	4·53	367·61	95.58	13.05	108.63	2,277	9,708	5,358	905	4	62·73	90·9	17·1	8·9	45·90
Réjane 2ème d'Ottawa	4	Nov. 21, '10.	317	17·7	5,598	5·34	351·58	91.41	10.49	161.90	1,884	9,835	5,339	997	4	58·07	104·0	16·5	9·5	43·83
Average	6		310	21·5	6,611	4·75	366·19	95.21	12.48	107.70	2,096	9,983	5,504	980	4	61·42	93·8	16·8	9·2	46·23
"GRADES."																				
Alma	10	Aug. 15, '10.	282	24·9	7,034	4·07	389·27	101.21	13.29	114.50	1,955	10,647	5,453	1,066	4	60·30	85·7	15·8	10·2	54·20
Dora	8	May 7, 10.	335	19·7	6,493	5·15	393·14	102.22	12.20	114.42	2,163	10,049	5,673	998	4	62·95	97·0	16·0	10·0	51·47
Queenie	13	Apr. 24, '10.	340	13·7	4,654	6·11	334·55	86.98	8.64	95.63	1,746	9,978	5,709	1,031	4	57·85	124·0	17·2	8·8	37·78
Average	10		319	19·4	6,060	5·32	372·32	96.80	11.38	108.18	1,955	10,225	5,612	1,032	4	63·70	102·2	16·3	9·7	48·15
"SHORTHORNS."																				
Illuminata	7	Nov. 25, '10.	327	26·2	8,555	3·77	379·74	98.73	8.18	106.91	2,314	10,827	5,890	1,096	4	66·57	77·8	17·5	8·5	40·34
Janet	11	Mar. 5, '11.	265	21·7	5,755	4·17	282·58	73.47	10.94	84.41	1,823	10,955	5,786	1,180	4	60·31	105·0	21·4	4·6	24·07
Ottawa Lass	9	Feb. 21, '10.	365	17·5	6,384	3·73	280·44	72.91	12.21	85.12	2,170	10,836	5,921	1,102	4	64 89	102·0	23·1	2·9	20·23
Average	9		319	21·8	6,898	3·89	314·25	81.70	10.41	92.15	2,102	10,872	5,866	1,126	4	63·93	94·9	20·7	5·3	28·21

"AYRSHIRES."

Flavia	9	Mar. 25, '11	292	31·4	9,168	3·76	406·24	105.63	17.71	123.33	2,613	11,097	5,691	1,220	4	70·12	76·5	17·2	8·8	[illegible]
Flavia II.	5	Jan. 6, '11	265	27·7	7,276	4·28	366·60	95 31	13.82	109 13	1,874	11,890	5,700	1,132	4	61·52	84·5	16 7	9·3	[illegible]
Denty IV	4	Mar. 21, '11	283	27·7	7,8[illegible]9	3·91	360·20	93.65	14.94	108.59	2,179	10,745	5,714	1,067	4	64·12	81·9	17 8	8·[illegible]	[illegible]
Average	6		279	28 9	8,091	3·98	377·68	98.20	15 49	113.68	2,222	11,244	5,702	1,140	4	65·25	80·9	17·2	8·8	[illegible]

"GUERNSEYS."

Ottawa Itchen	5	Nov. 25, '10	296	20·2	5,988	5·12	361·09	93 88	11.25	105.13	1,721	10,322	5,560	1,038	4	57·36	95·8	15·9	10·1	47·77
Dona Clatina	4	Sept. 14, '10	350	12 7	4,448	5·39	282·19	73.37	8.33	81.70	1,774	9,177	5,395	960	4	56·16	126·0	19·9	6·1	25·54
Pearly Prize	6	Mar. 15, '11	321	14·6	4,700	5·11	282·65	73.47	8.83	82.32	1,820	9,846	5,601	990	4	58·18	124·0	2[illegible]·6	5·4	24·14
Average	5		322	15·8	5,045	5·21	308·64	80.25	9.47	89.72	1,772	9,782	5,519	996	4	57·23	115·3	18·8	7·2	32·48

DAIRY COW RECORDS.

KEEPING RECORDS.

An increasingly large number of dairy farmers avail themselves of the offer made by this Division to supply, free of cost, forms whereon to keep records of the milk produced each day, or one day in each week, by each cow. This fact points to progress along right lines. It is only when one knows the individuals in one's herd that one can hope to improve the general quality of the herd.

The forms supplied are for week-long periods, as illustrated below, or for month-long periods, as may be preferred by the dairyman. In addition, forms for summarizing the month's work, as well as forms whereon to enter up the year's record, are sent on application.

DAILY MILK RECORD.

Herd belonging to............ ... .
Post office..... ....
Record for week ending.............. .. ..

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa, Ont.)

COWS.

Day.	Time.																	Total for day.
Sunday....	Morning......																	
	Evening......																	
Monday	Morning.. ...																	
	Evening																	
Tuesday........	Morning.....																	
	Evening																	
Wednesday.....	Morning.....																	
	Evening......																	
Thursday.	Morning......																	
	Evening......																	
Friday...... ...	Morning......																	
	Evening																	
Saturday...... .	Morning.....																	
	Evening......																	
Total.......	Week.																	

(Reverse.)

CENTRAL EXPERIMENTAL FARM.

Wm. Saunders, Director. J. H. Grisdale, Live Stock and Agriculture.

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pound of milk each year. To know the value of a cow, her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk record of their individual cows. A study of such records will soon indicate which cow should go to the butcher. We should be pleased to receive a summary of your record. If you have no summary forms, write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial, if you are a dairyman? It will increase your milk product. It will lighten your labour since your interest will be increased in your work and 'interest lightens labour.' It will show you the unprofitable cow, the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple spring balance may be secured for from one and a half to five dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing to J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

DISPOSAL OF MILK.

For a number of years, the milk produced on the Central Experimental Farm has been manufactured into butter and the skim milk fed to calves or pigs, this of course, with the exception of the small amounts of milk and cream sold daily to people living on the Farm or coming to the Farm to buy what they require. Disposing of the milk in this way has, during the last ten years, netted us an average price of about $1.65 per 100 lbs. of milk as drawn from the cow. Butter manufactured in our dairy has usually commanded a slight premium over the current market price. The average milk from our herd shows about 4½ per cent butter fat. We value the skim milk at 20 cents per 100 lbs. when feeding to calves or pigs. In each case, as will have been noted, we have more or less of an advantage over the average dairy farmer in Eastern Canada, so enabling us to net a price somewhat higher than the average.

CHEESE MAKING.

Our herd has been growing of recent years and the most profitable disposition of our milk product has become a more difficult problem on account of the rather limited demand for a high-class article of butter in this city. It is in summer more particularly that it is found difficult to dispose of all the butter manufactured, hence it was decided to attempt the manufacture of some small cheeses. During the past year accordingly, quite a number of Coulommier cheese and soft cream cheese have been manufactured here and sold in the local market.

The demand has not been found to be very great for either sort of cheese. As no advertising has been done, it is probably hardly fair to judge of the market possibilities by what we have been able to do here.

We have found, however, that milk made up into either one of these two sorts of soft cheese and sold at prices easily obtainable in Ottawa, or quite probably in any other city in Canada, brings about double what might be expected from it when sold in any other form.

Since the manufacture of either one of these is not at all a difficult process, the brief outline of the method of manufacture as practised here would probably be sufficient to enable anyone possessed of a fair amount of intelligence, to successfully manufacture either the one or the other after a few trials.

The notes on cream cheese have been prepared by myself with the help of Mr. Meilleur, our dairyman. The notes on Coulommier cheese are, by permission of Mr. J. A. Ruddick, Dairy and Cold Storage Commissioner, taken from a bulletin issued from the Dairy Commissioner's Branch, and specially prepared by Miss Janet McNaughton, N.D.D., late Instructor in Home Dairying, Macdonald College, Quebec.

CREAM CHEESE.

The cream cheese seems, if anything, to be the more popular. It is a cheese very easy to manufacture and requiring very little special apparatus. It has brought us in about $3 per 100 lbs. for our milk when manufactured and handled as described here.

The Cream.

A suitable quantity of cream wherewith to work is two gallons or about 20 lbs The cream should be fresh and should test from 12 to 18 per cent butterfat. It should be brought to a temperature of about 80° F.

A Starter.

When at this temperature, and to this amount of cream, a starter of about half a cup of good butter milk or sour cream having a pleasant flavour should be added and well stirred in.

Rennet.

For this amount of cream dissolve 40 drops rennet in 1 ounce water and pour slowly into the cream, stirring well while adding to insure thorough mixing. Let the material stand for from 1½ to 2 hours or until the curd is fairly firm. A suitable degree of firmness may be said to have been reached when the curd breaks clean in front of a lead pencil or similar article moved slowly through the mass.

Straining.

When the curd is fairly firm, it should be removed from the whey with a skimmer or ladle and laid gently on the straining cloths which should line a couple of pails preparatory to receiving the curd straining. Huckaback towelling is about the most suitable material to use as a strainer. The strainers should be about 2 feet square. The curd from 2 gallons of cream should be divided into 2 fairly equal portions for straining. It should be allowed to hang for 24 hours.

Salting and Pressing.

When the whey has been fairly well strained out, say in about 24 hours, the cloth should be changed, fine salt added to suit, then rewrapped and put under slight pressure for a few hours. The degree of pressure and the length of time to be kept under pressure will be indicated by the condition of the curd when salted. A soft curd would need, say 8 lbs. pressure for 7 or 8 hours, while a fairly dry, firm curd might require only 4 lbs. pressure for 4 or 5 hours. A common brick weighs 4 lbs., and one or two serve as very suitable weights for pressing the cheese.

Moulding.

Pressure should be removed when the curd is dry enough, and as soon as convenient, the curd should be moulded into some suitable form. A very good shape is a cylinder from 1 to 1½ inches deep and about 3 inches across. Such a cheese weighs from 5 to 6 ounces. When moulding, the cheese should be pressed into a cheese cloth cover, just enough to protect the curd from too ready contamination and to help lend firmness to the cheese.

Selling.

Cheeses of this size sell for 15 cents and 2 gallons cream, 16 per cent butterfat, will make 20 or 21 of them. Besides the cheese cloth, an envelope, card-board or stiff

paper carton should be provided as a protection against either hard or readily disintegrating substances likely to spoil the appearance or injure the quality of the delicate product.

Keeping Qualities.

Such cheese keeps for a short time only and had better be used when quite fresh.

COULOMMIER CHEESE.

Accommodation.

Any clean room with good ventilation and where a fairly even temperature can be maintained will do to make the cheese in. The cleanliness, however, is very important. Perhaps a clean, air cellar is best of all, because there is a fairly even temperature can be maintained, and it is cool in summer. It must, however, be free from dust and smells, as cheese, like all milk products, is very easily tainted and very readily absorbs surrounding odours. The best room temperature is from 60° F. to 65° F. If the room gets overheated, the cheese is apt to drain too quickly, there is loss of fat and a hard, dry cheese is the result. If, on the other hand, the room is too cold, the cheese does not drain quickly enough and it may develop a bad or bitter flavour.

Milk.

Sweet and clean new milk of good quality makes the best cheese. All the fat or cream should be left in the milk. Skim milk makes a very hard, dry, unpalatable cheese. Acid milk also makes a harsh, dry cheese.

Rennet.

Rennet may be used in either the extract or tablet form. Where only small quantities are used, the tablets are best, as they are easier to obtain fresh in small quantities and keep better. Rather less should be used than that recommended in the directions for junket, as in this case a soft curd is wanted, which will take from two to three hours to coagulate.

Salt.

Pure dairy salt with a fine grain which will dissolve readily, should be used. It may not be generally known that salt absorbs surrounding odours almost as readily as milk. It should, therefore, be kept in a pure atmosphere.

Appliances—Vessels to Hold Milk.

Wooden tubs with lids are best, but are by no means absolutely indispensable. Wood is a poor conductor of heat and we want to maintain an even temperature of the milk after setting, for two reasons. In the first place if the temperature of the milk falls much before ladling, the curd will not drain so well in the mould. In the second place, cream always rises best on the milk in a falling temperature. If we let the temperature fall much during coagulation, we shall have a thick layer of cream on the top of the curd. The consequence of this will be that some of the fat will pass off in the whey and be lost, while what remains in the curd will not be evenly distributed, but will appear in streaky masses throughout the finished cheese. Oak is the best wood, as it is most durable and, being hard, it is easily cleaned. If tubs are not convenient, pails of either tin or enamel may be used instead.

Draining Table.

The table on which the cheeses are set to drain should slope slightly and should have an outlet at the lower end for carrying off the whey. A pail should be placed

under the outlet to receive the whey. Wooden tables are often made with a ridge round the edge and covered with galvanized tin. This is the most suitable style for the early stages of making where there is a large amount of drainage

Another style of table is made of hardwood with grooves leading to an outlet in the centre where the whey drains off into the pail. This table is more suitable for draining the cheese the second day after it is turned. A shelf may be fitted up in the same way. To begin with, however, an ordinary table may be tilted a little at one end, so that the whey will drain to a given corner where it can be caught, or a board may be laid in a sloping fashion on the table and the cheese moulds set on that.

Moulds.

Moulds for holding the curd are round and made of tin in two pieces to facilitate the turning of the cheese. They are 5¼ inches in diameter and 5 inches in height. The lower half is two inches high and the top half or collar is three inches high. They cost about thirty-five cents each and can be bought from the Canadian Dairy Supply Company, Youville Square, Montreal.

Boards and Straw Mats.

These are required to lay the cheese on. No pressure is given to the cheese. The straw mats are placed on the boards underneath the moulds into which the curd is ladled, and the whey drains off through the straw. Each board and mat holds two moulds. The boards are fourteen by eight inches and half an inch in thickness. These can be easily made at home. The straw mats are the same size as the boards and can also be made at home in spare moments. They are usually made by the peasantry in the north of France of wheat or rye straw very neatly and evenly threaded together. They cost about five cents each. Where, however, time is too scarce to make them and there is difficulty in obtaining them ready made, a double fold of coarse, open linen may be used instead. After using, the mats should be rinsed in cold water, then in warm water and scalded or boiled, and placed, if possible, in the sun to dry. If washed carefully, they will last a long time.

Ladle.

A ladle is necessary for transferring the curd from the pails to the moulds. This ladle may be of tin or enamel. The edge should be sharp, so that it will make as clean a cut as possible. If it is thick or rough, it will tear the curd and there will be loss of fat.

Thermometer.

A reliable floating dairy thermometer is a necessity. They can be got for twenty-five cents each. No uniformity can be obtained by rule of thumb, and a mistake of a few degrees in temperature may make a considerable difference in the character of the cheese.

Measuring Glass for Rennet.

When rennet extract is used, it is well to invest in a small drachm glass for measuring the rennet. These glasses can be got from any chemist, graded to show the number of drops. They cost twenty-five cents each.

Paper and Boxes.

Grease-proof parchment paper will be required to wrap the cheese in, if it is to be sent to market. It can be obtained from any dairy supply house. Cardboard boxes can be had from any of the folding-box manufacturers and cost from three to five dollars per thousand.

Method of Making.

Requirements for two cheese:—

One gallon new milk
Fifteen drops rennet extract.
One ounce pure dairy salt.

1. Strain the milk into a clean pail or other suitable vessel.

2. Get the milk to a temperature of 80° F.

3. Dilute the rennet with about ten times its bulk of water, in order to get it evenly mixed and more easily distributed. Add it to the milk and stir gently to bottom of the pail for three minutes.

4. Cover the pail with a clean cloth in order to retain heat. Four folds of butter muslin will do nicely. If the temperature of the room is low, it is advisable to set the vessel containing the milk in another containing water two degrees higher in temperature than the milk. If the temperature of the water falls below 80° F. a little warm water may be added to it. 60 to 65° F. is the best room temperature.

5. Stir the surface of the milk gently with the end of the thermometer to keep the cream from rising. Do this every ten minutes or so for the first half hour. Do not stir after the milk has begun to coagulate.

6. Lay the board with the straw mat on it and the two moulds with collars, where they can drain undisturbed in as even a temperature and as free from draughts as possible. The time the curd takes in draining will depend to a considerable extent on the temperature of the room and on the manner in which the curd is ladled. If the temperature falls much below 60° F. the curd will take too long to drain and may have a bitter flavour. If kept at too high a temperature, or if ladled roughly, there will be a loss of fat and the result will be a harsh, dry cheese. If ladled in thin slices, it will drain more quickly than if ladled in thick slices. When a nice soft coagulum has formed, which ought to be in from two to three hours, take out a large ladleful of curd and set it aside to form smooth tops for the cheese. Then gently ladle the rest of the curd into the moulds in thin slices, putting on last of all the curd from the ladleful which was set aside. If the tins do not hold all the curd to begin with, the remainder may be added as soon as that in the tins has sunk sufficiently.

7. When the curd has sunk to the lower edge of the collar, which should be in from twenty to thirty hours, remove the collars gently, place a clean mat and board on the top of the moulds and turn them over. Care must be exercised in removing the first mat, as the curd is apt to adhere to it. It is best to roll it backwards gently like a roll of paper.

8. Sprinkle the top of the curd with good salt, about ½ oz. between two cheeses.

9. Wash the draining table, replace the cheese on it and let the cheese drain for another twenty-four hours.

10. At the end of that time, turn as before and sprinkle the other side with a similar amount of salt. In twenty-four hours after this, the cheese should be ready for eating, if they are used fresh, but if not disposed of, the moulds may be removed and the cheese turned daily.

11. Wrap neatly in grease-proof parchment paper, pack in cardboard boxes and send to market.

BEEF PRODUCTION.

The experiments conducted with beef cattle this year have not been wholly of a comparative nature.

The work here reported upon includes three lots of Angus steers purchased in Wellington county and put on feed April 1, 1910, and two lots of Shorthorn steers carried over from the previous year. The latter were reported upon last year as steer calves, dropped in June, 1909.

Lot 1.

Number of steers in lot	4
First weight, gross, April 1, 1910 . . lbs.	3,458
First weight, average . . "	864·5
Finished weight, gross, January 16, 1911 . . "	5,335
Finished weight, average . . "	1,333·7
Total gain in 290 days . . "	1,877
Average gain per steer . . "	469·2
Daily gain per steer . . "	1·62
Daily gain per lot, 4 steers . . "	6·48
Gross cost of feed . . $	155 79
Cost of 100 lbs. of gain . . cts.	8·3
Valuation put on beef, April 1, 1910 . . $	207 48
Total cost to produce beef	363 27
Sold 5,335 lbs. at $7.50 per 100 lbs., less 5 per cent	380 10
Profit	16 83
Profit per steer	4 20
Average valuation per steer to start	51 87
Average selling price per steer	95 02
Average increase in value	43 15
Average cost of feed per steer	38 95
Amount of meal eaten per lot of 4 steers . . lbs.	7,064
Amount of ensilage and roots eaten . . "	31,621
Amount of hay eaten . . "	8,514
Amount of straw eaten . . "	3,752

Meal consisted of bran, 4,238·4 lbs.; gluten, 1,412·8 lbs.; oil cake meal, 1,413·8 lbs. The roughage was clover hay, corn ensilage, turnips, mangels and oat straw. Roots were fed during the winter months only. They were pulped and mixed with ensilage in the proportion of one part of the former to five parts of the latter.

Lot 2.

Number of steers in lot	4
First weight, gross, April 1, 1910 . . lbs.	2,770
First weight, average . . "	692·5
Finished weight, gross, January 16, 1911 . . "	4,480
Finished weight, average . . "	1,120
Total gain in 290 days . . "	1,710
Average gain per steer . . "	427·5
Daily gain per steer . . "	1·47
Daily gain per lot, 4 steers . . "	5·89
Gross cost of feed . . $	129 98
Cost of 100 lbs. gain . . cts.	7·6
Valuation put on beef, April 1, 1910 . . $	166 20
Total cost to produce beef	296 18
Valued, 4,480 lbs. at $7.50 per 100 lbs., less 5 per cent	319 20
Profit	23 02
Profit per steer	5 75
Average valuation per steer to start	41 55
Average value price per steer at finish, January 16, 1911	79 80
Average increase in value	38 25
Average cost of feed per steer	32 49
Amount of meal eaten per lot of 4 steers . . lbs.	5,249

Amount of ensilage and roots eaten	lbs.	29,002
Amount of hay eaten	"	8,502
Amount of straw eaten	"	3,338

Meal consisted of bran, 3,149·4 lbs.; gluten, 1,049·8 lbs.; oil cake meal, 1,049·8 lbs. Roughage was clover hay, corn ensilage, turnips, mangels and oat straw. Roots were fed during the winter months only. They were pulped and mixed with ensilage in the proportion of one part of the former to five parts of the latter.

Lot 3.

Number of steers in lot		4
First weight, gross, April 1, 1910	lbs.	1,793
First weight, average	"	448·2
Finished weight, gross, January 16, 1911	"	3,570
Finished weight, average	"	892·5
Total gain in 290 days	"	1,777
Average gain per steer	"	444·2
Daily gain per steer	"	1·53
Daily gain per lot, 4 steers	"	6·12
Gross cost of feed	$	86 01
Cost of 100 lbs. gain	cts.	4·8
Valuation put on beef, April 1, 1910	$	89 65
Total cost to produce beef		175 66
Valued 3,570 lbs. at $6.50 per 100 lbs., less 5 per cent		220 45
Profit		44 79
Profit per steer		11 19
Average valuation per steer to start		22 41
Average selling price per steer		55 11
Average increase in value		32 70
Average cost of feed per steer		21 50
Amount of meal eaten per lot of 4 steers	lbs.	3,041
Amount of ensilage and roots eaten	"	18,678
Amount of hay eaten	"	7,334
Amount of straw eaten	"	2,144

Meal fed consisted of bran, 1,824·6 lbs.; gluten, 608·2 lbs.; oil cake meal, 608·2 lbs. Roughage was clover hay, corn ensilage, turnips, mangels and oat straw. Roots were fed during the winter months only. They were pulped and mixed with ensilage in the proportion of one part of the former to five parts of the latter.

Lot 4.

Number of steers in lot		5
First weight, gross, April 1, 1910	lbs.	2,801
First weight, average	"	560
Finished weight, gross, January 16, 1911	"	5,165
Finished weight, average	"	1,033
Total gain in 290 days	"	2,364
Average gain per steer	"	472·8
Daily gain per steer	"	1·63
Daily gain per lot, 5 steers	"	8·15
Gross cost of feed	$	159 94
Cost of 100 lbs. gain	cts.	6·77
Valuation put on beef, April 1, 1910	$	140 05
Total cost to produce beef		299 99

Valued, 5,165 lbs. at $6.50 per 100 lbs., less 5 per cent		342 97
Profit		42 98
Profit per steer		8 59
Average valuation per steer to start		28 01
Average selling price per steer		68 59
Average increase in value		40 58
Average cost of feed per steer		31 98
Amount of meal eaten per lot of 5 steers	lbs.	7,764
Amount of ensilage and roots eaten	"	33,668
Amount of hay eaten	"	6,650
Amount of straw eaten	"	3,759

Meal consisted of bran, 4,658·4 lbs.; gluten, 1,552·8 lbs.; oil cake meal, 1,552·8 lbs. Roughage was clover hay, corn ensilage, turnips, mangels and oat straw. Roots were fed during winter months only. They were pulped and mixed with ensilage in the proportion of one part of the former to five parts of the latter.

Lot 5.

Number of steers in lot		3
First weight, gross, April 1, 1910	lbs.	1,252
First weight, average	"	417·3
Finished weight, gross, January 16, 1911	"	2,770
Finished weight, average	"	923
Total gain in 290 days	"	1,518
Average gain per steer	"	506
Daily gain per steer	"	1·74
Daily gain per lot, 3 steers	"	5·22
Gross cost of feed	$	99 31
Cost of 100 lbs. gain	cts.	6·54
Valuation put on beef, April 1, 1910	$	62 60
Total cost to produce beef		161 91
Value, 2,770 lbs. at $6.50 per 100 lbs., less 5 per cent		171 03
Profit		9 12
Profit per steer		3 04
Average valuation per steer to start		20 86
Average selling price per steer		57 01
Average increase in value		36 15
Average cost of feed per steer		33 10
Amount of meal eaten per lot of 3 steers	lbs.	5,290
Amount of ensilage and roots eaten	"	18,730
Amount of hay eaten	"	3,185
Amount of straw eaten	"	2,190

Meal consisted of bran, 3,174 lbs.; gluten, 1,058 lbs.; oil cake meal 1,058 lbs. Roughage was clover hay, corn ensilage, turnips, mangels and oat straw. Roots were fed during the winter months only. They were pulped and mixed with ensilage in the proportion of one part of the former to five parts of the latter

Owing to the fact that on January 16, some of the steers from different lots were sold, and some others purchased, a re-grouping was necessary. The purchased steers were put into the pens on January 28, and for that reason the following lots are reported upon from that date, rather than from January 16.

Lot 6.

Number of steers in lot		5
First weight, gross, January 28, 1911	lbs.	5,500
First weight, average	"	1,100
Finished weight, gross, March 31, 1911	"	6,120
Finished weight, average	"	1,224
Total gain in 62 days	"	620
Average gain per steer	"	124
Daily gain per steer		2·0
Daily gain per lot, 5 steers		10·0
Gross cost of feed	$	52 20
Cost of 100 lbs. gain	cts.	8·4
Average cost of feed per steer	$	10 42
Amount of meal eaten per lot of 5 steers	lbs.	2,800
Amount of ensilage and roots eaten	"	8,925
Amount of hay eaten	"	1,890
Amount of straw eaten	"	1,115·2

Lot 7.

Number of steers in lot		5
First weight, gross, January 28, 1911	lbs.	5,690
First weight, average	"	1,138
Finished weight, gross, March 31, 1911	"	6,370
Finished weight, average	"	1,274
Total gain in 62 days	"	680
Average gain per steer	"	136
Daily gain per steer	"	2·2
Daily gain per lot, 5 steers	"	11·0
Gross cost of feed	$	45 31
Cost to produce 100 lbs. gain	cts.	6·66
Average cost of feed per steer	$	9 06
Amount of meal eaten per lot of 5 steers	lbs.	2,240
Amount of ensilage and roots eaten	"	8,925
Amount of hay eaten	"	1,890
Amount of straw eaten	"	1,115·2

Lot 8.

Number of steers in lot		4
First weight, gross, January 28, 1911	lbs.	3,725
First weight, average	"	931
Finished weight, gross, March 31, 1911	"	4,210
Finished weight, average	"	1,052·5
Total gain in 62 days	"	485
Average gain per steer	"	121
Daily gain per steer	"	1·95
Daily gain per lot, 4 steers	"	7·82
Gross cost of feed	$	32 61
Cost of 100 lbs. gain	cts.	6·72
Average cost of feed per steer	$	8 15
Amount of meal eaten per lot of 4 steers	lbs.	1,624
Amount of ensilage and roots eaten	"	5,714
Amount of hay eaten	"	1,575
Amount of straw eaten	"	714

Lot 9.

Number of steers in lot..		4
First weight, gross, January 28, 1911..	lbs.	3,860
First weight, average..	"	965
Finished weight, gross, April 8, 1911 ..	"	4,335
Finished weight, average..	"	1,084
Total gain in 70 days..	"	475
Average gain per steer ..	"	118·7
Daily gain per steer..	"	1·69
Daily gain per lot, 4 steers..	"	6·79
Gross cost of feed..	$	44 87
Cost of 100 lbs. gain..	cts.	9·44
Average cost of feed per steer ..	$	11 22
Amount of meal eaten per lot of 4 steers ..	lbs.	2,506
Amount of ensilage and roots eaten ..	"	6,384
Amount of hay eaten..	"	1,743
Amount of straw eaten..	"	798

SHEEP.

Another fairly successful year may be reported so far as breeding operations with sheep are concerned. We seem to have learned how to guard against internal parasites, though stocking heavily on a small area. The feeding of more or less soiling crop and the following of a short rotation appears to be the proper method to follow. Leaving sheep more than one year on a pasture closely fed down has invariably resulted disastrously for us. The keeping them for only one year on the pasture has for two seasons now seemed to overcome practically all danger from the stomach or intestinal worm.

EXPERIMENT IN FATTENING LAMBS.

In order to gain further information on the relative value of corn silage and of roots for fattening lambs, an experiment similar to that conducted in 1909-1910, was undertaken.

Twenty mixed grade wethers, three pure-bred Leicester ewes and four pure-bred Shropshire ewes, all about seven months of age, were used in this trial. The wethers were purchased in Carleton county, and as they had come from rough pasture, they were in just fair shape before being placed under experiment. The ewes were of our own breeding and were in a thrifty condition but not fat.

Some days before being grouped they were dipped.

On the morning of December 7, 1910, they were divided into three lots of nine each, and put on test. The experiment covered a period of 124 days.

Lot No. 1.—Seven wethers, 1 Leicester ewe and 1 Shropshire ewe weighed 953 lbs.

Lot No. 2.—Seven wethers, 1 Leicester ewe and 1 Shropshire ewe weighed 953 lbs.

Lot No. 3.—Six wethers, 1 Leicester ewe and 2 Shropshire ewes weighed 954 lbs.

Until December 22, they received clover hay only, at the rate of 3 lbs. per head per diem. From the morning of that date they were fed as follows:—

Each lamb of each group received 8 ozs. per diem during the first week, 10 ozs. the second week, 12 ozs. the third week, 14 ozs. the fourth week, 16 ozs. the fifth week, 18 ozs. the sixth and seventh weeks, 20 ozs. the eighth and ninth weeks, 22 ozs.

the tenth and eleventh weeks, and 24 ozs. for the remainder of the feeding period, of a meal mixture constant in composition: 200 lbs. bran, 200 lbs. oats and 100 lbs. nutted oil cake.

As roughage, lot 1 were given as much turnips as they would eat; lot 2 were given as much ensilage as they would eat; lot 3 were fed as much turnips and ensilage as they would take, in the proportion of about 7 of roots to 6 of ensilage. Of good clover hay, each lamb in each lot received 1⅓ lbs. per day throughout the entire experiment.

The meal was mixed with the turnips and ensilage in each case, and was fed twice daily.

The hay was given three times daily.

The morning feed was given between 8 and 8.30, the noon feed between 11.45 and 12, and the night feed between 4.15 and 4.45.

It was aimed to feed as much turnips and ensilage as the animals would consume without inducing scouring. Turnips from a comparatively small amount at first, were gradually increased until they received about 7½ lbs. per lamb per diem. Of ensilage, the lambs would eat up clean only about 5 lbs. per diem, and of the mixture of ensilage and turnips, 6½ lbs. was the maximum amount consumed per lamb per diem.

They all remained in good health throughout the experiment.

The first weighing was made at 10 a.m. the day lambs were placed on trial; the second weighing was made 16 days later. Subsequently they were weighed every two weeks at the same hour of the day till the last day of the experiment.

In calculating the cost of feeding, the following prices were charged:—

	Per ton.
Roots (turnips)	$ 2 00
Ensilage (corn)	2 00
Hay (clover)	7 00
Bran	20 00
Nutted oil cake	35 00
Whole oats	25 00

TABLE I.—Lamb Feeding Experiment.

(Weights, Gains and percentage dressed.).

Ear Tag Number.	First Weight.	Last Weight.	Gains.	Weight of Carcass.	Percentage Dressed.	Daily gain per sheep.
Lot 1.	Lbs.	Lbs.	Lbs.	Lbs.	%	Lbs.
Number 116	90	136	46	65	47·8	·37
" 107	96½	123	26½	50	40·7	·21
" 120	99	129	30	52	40·3	·24
" 114	100½	131½	31	59	44·9	·25
" 77	101	122	21	Not killed	....	·17
" 29	114	124½	10½	"	....	·08
" 110	110	142	32	73	51·4	·26
" 113	114	158	44	72	45·6	·35
" 10[illegible]	128	155	27	72	46·5	·22
Total	953	1,221	268	443	....	....
Average	106	136	30	63	45·3	·24
Lot 2.						
Number 104	91	128	37	60	46·9	·30
" 105	93	133½	40½	65	48·7	·33
" 118	102½	141	38½	70	49·6	·31
" 106	103	153½	50½	70	45·6	·41
" 108	107½	133	25½	66	49·6	·21
" 73	100	129	29	Not killed	....	·23
" 20	119½	141½	22	"	....	·18
" 101	117½	158½	41	80	50·5	·33
" 112	119	163	44	80	49·1	·35
Total	953	1,281	328	...	....	....
Average	106	142	36½	70	48·6	·29
Lot 3.						
Number 117	92½	134½	42	70	52·0	·34
" 76	99½	126	26½	Not killed	....	·21
" 102	96	129	33	61	47·3	·27
" 119	97	150	53	70	46·6	·43
" 103	106½	137	30½	70	51·1	·25
" 28	108	131	23	Not killed	...	·19
" 115	106	144	38	68	47·2	·31
" 82	115½	144	28½	Not killed	....	·23
" 111	133	162	29	75	46·8	·23
Total	954	1,257½	303½	....	....	....
Average	106	139½	33½	69	48·4	·27

TABLE 2.—Lamb Feeding Experiment.

(Summary—27 lambs.)

First weight, three lots, 27 lambs	lbs.	2,860
Average first weight	"	106
Rate of gain per day, average	"	·269
Final weight of whole lot	"	3,759·5
Final weight, average	"	139
Cost of feeding 27 lambs, 124 days	$	70 23
Total gain in period	lbs.	899·5
Cost of 1 lb. gain for whole lot	cts.	7·8

Amount of various kinds of feed consumed for 1 lb. gain live weight during 124 days:—

Bran	lbs.	1·50
Oats	"	1·50
Oil cake	"	·75
Hay	"	5·76
Turnips	"	5·96
Ensilage	"	4·98
Amount dry matter consumed for one pound gain during period	"	9·83

TABLE 3.—Lamb Feeding Experiment.

(Table of weights and gains).

Date of Weighing.	LOT 1.		LOT 2.		LOT 3.	
	Total weights by lots.	Gain per lamb per day.	Total weights by lots.	Gain per lamb per day.	Total weights by lots.	Gain per lamb per day.
December 7, 1910	953	....	953	....	954	....
" 22 "	1,002	·31	988	·24	996½	·23
January 5, 1911	974½	·22*	994½	·05	985½	·09*
" 19 "	1,006½	·25	1,022½	·22	1,013	·22
February 2 "	1,036½	·24	1,052½	·24	1,053	·32
" 16 "	1,094	·46	1,131½	·63	1,099½	·37
March 2 "	1,131½	·30	1,156	·20	1,132	·26
" 16 "	1,194½	·50	1,228	·57	1,213	·64
" 30 "	1,229½	·28	1,271	·34	1,254½	·33
April 9 "	1,221	·09*	1,281	·11	1,257½	·03
Average	.....	·24	.....	·29	......	·27

* Loss.

TABLE 4.—Lamb Feeding Experiment.

GENERAL STATEMENT.—Turnips vs. Corn Ensilage as Succulent Feed for Fattening Lambs.

		Lot 1.	Lot 2.	Lot 3.
Number of lambs in lot		9	9	9
Number of days in experiment		124	124	124
Total weight at beginning of experiment	lbs.	953	953	954
Total weight at end of experiment	"	1221	1,281	1,257½
Gain per period	"	268	328	303½
Gain per head	"	30	36½	33½
Gain per head per day	"	·24	·29	·27
Quantity of meal eaten by lot for period	"	1127	1,127	1,127
Quantity of clover hay eaten by lot for period	"	1728	1,728	1,728
Quantity of roots (turnips) eaten by lot for period	"	3496	....	1,866
Quantity of ensilage (corn) eaten by lot for period	"	....	2,909	1,570
Total cost of feed	$	23·63	23·04	23·56
Cost of feed per head	"	2·63	2·56	2·62
Cost of feed per head per day	cts.	2·11	2·06	2·11
Cost to produce one pound gain	"	8·8	7·03	7·76
Original cost of sheep at 6·25 cents per lb. live weight	$	59·56	59·56	59·62
Original cost of sheep plus cost of feed	"	83·19	82·66	83·18
Sold at 7·50 cents per lb. live weight	"	91·57	96·07	94·31
Net profit on lot	"	8·38	13·41	11·13
Net profit per lamb	"	·93	1·49	1·23

TABLE 5.—Lamb Feeding Experiment.

Some Scientific Findings in Connection Therewith.

	Lot 1.	Lot 2.	Lot 3
Pounds dry matter required to produce one pound increase in live weight	10·4	9·4	9·8
Nutritive ratio of ration	1 : 3·6	1 : 3·6	1 : 3·6
Meal required to produce one pound increase in live weight .... lbs.	4·2	3·4	3·7
Roughage " " " " .... "	19·5	14·1	17·
Hay " " " " .... "	6·4	5·3	5·7
Roots " " " " .... "	13·	....	6·1
Ensilage " " " " .... "	....	8·9	5·2
Pounds digestible matter consumed to produce one pound increase in live weight	6·5	5·5	5·9

Compared with the results obtained last year, ensilage as against turnips showed up to better advantage. Whereas last year the cost to produce one pound gain was 10 cents with turnips and 9 cents with ensilage, this year the gain with turnips cost 8·8 cents per pound, and with ensilage 7·03 cents per pound. Both these tests, therefore, indicate superiority of ensilage over turnips for fattening lambs, and, while the results representing the difference may not be taken as final, it is quite evident that ensilage can be profitably used as a part of the roughage ration.

SWINE.

During the year as already indicated above, a new piggery has been erected in the place of that part of the piggery known as the main piggery. The building operations effectually prevented the carrying on of any experimental work, so no report of feeding operations is submitted save the following summary.

SUMMARY OF PIGGERY OPERATIONS, 1910-11.

Total sales during year	$2,979 53	
Value of manure produced	200 00	
Value of pigs on hand, April 1, 1911	4,371 20	
		$7,550 73
Cost of feed during year	$1,930 41	
Cost of bedding	60 00	
Stock bought during year	155 00	
Cost of labour	975 00	
Value of stock on hand, April 1, 1910	2,425 00	
		5,545 41
Profit for one year		$2,005 32

FINANCIAL STATEMENT.

Below are submitted inventories and returns from the various classes of live stock under my charge during the year April 1, 1910, to March 31, 1911.

Class.	April 1, 1910.		April 1, 1911.		Returns.	Gross returns made up of increase in value of products and value of animals sold.
	No.	Value.	No.	Value.	Value.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses	19	... ...	18	....	3,947 02	3,947 02
Breeding cattle	121	16,705 00	139	17,650 00	6,336 28	7,281 28
Steers	22	740 00	19	1,369 00	713 56	1,342 56
Sheep	54	775 00	88	1,139 00	148 05	512 05
Swine	65	2,425 00	174	4,371 20	3,024 53	5,070 53
Total	281	20,645 00	438	24,529 20	14,169 44	18,153 44

SUMMARY OF LIVE STOCK OPERATIONS.

Returns.

Gross returns from animals of all classes, including value of products, value of services and increase in value of young stock	$18,153 44
Manure, 1,500 tons at $1 per ton	1,500 00
Total	$19,653 44

EXPENDITURE—VALUE OF FOOD CONSUMED.

Meal, grain, etc. (market price)	$ 5,366 18
Hay at $7 per ton	1,286 04
Roots, ensilage, green feed at $2 per ton	1,911 90
Whole milk, 23,600 lbs. at $1 per 100 lbs.	236 00
Skim milk, 243,000 lbs. at 20 cents per 100 lbs.	486 00
Straw, 165 tons at $5 per ton	825 00
Total	$10,111 12

Cost of labour in connection with care of horses, cattle, sheep and swine:—

Herdsman	$ 720 00
One man	600 00
Four men at $528	2,112 00
One man	500 00
Extra help, teaming, etc.	246 00
	$ 4,178 20
Total expenditure	14,289 32
Balance	5,364 12
Less cost of new stock purchased, 1910-11	735 00
Net balance	$ 4,629 12

SUMMARY OF FARMING AND LIVE STOCK OPERATIONS ON 200-ACRE FARM, 1910.

Returns.

Total value of returns from fields	$ 5,761 28
Total value of returns from live stock	19,653 44
Total returns	$25,414 72

Expenditure.

Total cost of field operations	$ 2,806 75
Total cost of live stock operations	14,289 32
Expended, buying stock	735 00
Total expenditure	$17,831 07
Balance	7,583 65

COMPARATIVE Statement of Crops on '200 Acre Farm,' from 1899 to 1910 inclusive. (200 Acre Farm includes 7 Acres of Road.)

Year.	Grain.		Hay.		Roots and Corn.		Pasture.		Soiling Crop.		Pig Pasture.		Remarks.
	Area in Acres.	Yield in Pounds.	Area in Acres.	Yield in tons.	Area in Acres.	Yield in Tons.	Area in Acres.	Number of Cattle.	Area in Acres.	Disposition of Crops.	Area in Acres.	Crops Grown for Pasture.	
1899	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	....	....	Generally considered a good year for all crops.
1900	80	126,621	53	138	40	743	20 and aftermath.	49	....	....	...	....	Season very favourable for most crops.
1901	79	114,472	58	210	40	702	16 and aftermath.	52	....	....	....	....	" " "
1902	74	144,914	60	216	39	665	20 and aftermath.	62	....	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903	69	126,619	62	154	34	473	16 and aftermath.	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.
1904	67	112,009	60	192	46¾	674	13·75	98	3	" " ..	3	" " ..	Season unfavourable for grain and corn, good for hay and roots.
1905	66	111,932	59	258	47	971⅓	14 and aftermath.	100	5	All cattle ensilage fed.	4	Clover, rape, mixed crop, peas, roots and alfalfa.	Season favourable for hay, corn and roots, too wet for grain on mucky land.
1906	69	125,516	62	140	48	774½	14	105	5	" " ..	3	" " ..	Very bad season. Meadows winter killed. Summer too dry.
1907	61	102,494	73	227	46	704	13·75	110	5	" " ..	3	" " ..	Bad hay year. Grain fair. Corn and roots poor.
1908	61	63,003	62	175	49	670	14	120	5	" " ..	3	" " ..	Very bad year for all classes of crops. Too dry.
1909	65	106,572	57	142	49	878	14	142	5	" " ..	3	" " ..	Bad hay year. Grain fair. Corn and roots good.
1910	59	110,128	60	190	53	880	14	160	5	" " ..	3⅓	" " ..	Fairly good year for all crops.

Of the area indicated as having been used as pasture for swine in 1905, 3 acres yielded a crop of green feed for soiling cattle before being given over to swine. Cattle were pastured on roads where possible. A small rough field not included in '200 Acre Farm' is used as partial pasture and run for about 20 head of young stock. These cattle receive ensilage or other succulent food every day, and meal at the rate of about 1½ lbs. each day part of the time.

The variety of crops grown and the varying areas under each crop each year, make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products and the return of each year valued accordingly.

Fixing prices as follows:—Grain, $1 per 100 lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; summering cattle, $8 per season, and an area used as pasture for pigs, $15 per acre, the returns from the '200-acre farm' for the years mentioned may be said to have been worth $2,776.66 in 1899, $4,110.21 in 1900, $4,434.72 in 1901, $4,787.14 in 1902, $4,148.19 in 1903, $4,741.09 in 1904, $5,714.32 in 1905, $4,669.16 in 1906, $4,931.94 in 1907, $4,631.33 in 1908, $5,502.15 in 1909 and $5,761.28 in 1910.

REMARKS ON ROTATION EXPERIMENTS.

The true farmer will ever have two objects in view when managing his farm: to so manage as to increase gradually but surely the margin of profit and, at the same time, render his farm more productive. Many factors will necessarily unite to produce such desirable results, but of one feature we may be certain, there will be followed on such a farmer's farm a regular rotation of crops, for no other single practice in farm management can compare with this in importance. The rotation or rotations adopted will, of course, depend upon the line of farming followed, and to some extent upon the character of the soil and the physical peculiarities of the farm as a unit, but a rotation there will be.

Crop rotation means a certain succession of crops which regularly repeats itself each time the course is run. It really means further that the crops follow each other in such order as to insure each having such supplies of plant food of such a character as to aid in securing good returns from each particular crop.

Hence, in arranging a rotation, it is very necessary to have some knowledge of the food requirements of different crops and to know something of the values of the residues from the different crops included. Certain forage crops, such as corn, roots, potatoes and hay require an immense amount of food for stem, leaf and root production—that is an abundance of nitrates as is found in clover or other sod turned down and in well-manured lands. Other crops, such as cereals, can get along best with a lighter supply of nitrates, but need more phosphates, hence do well after some forage crop has taken up the superabundance of free nitrates found after sod. It is evident, therefore, that a good rotation will include (1) meadow or pasture, (2) roots or corn, and (3) some cereal crop.

Various combinations of these three classes are possible, and the natural aim of experimental work will be to determine (1) the comparative values of rotations as soil improvers, and (2) their relative suitability for different lines of farming.

Five or six years experience with a rotation of five years' duration showed such remarkable results here, that, in 1904, it was decided to begin an experiment that would include a variety of rotations.

Rotation 'A.'

First year.—Land ploughed in August, well worked, ribbed in October; seeded next spring to oats, and 10 lbs. clover sown per acre; allowed to grow one year and turned under as fertilizer for corn.

Second year.—Corn, manure applied in winter or spring, 25 tons per acre; shallow ploughed, corn planted.

Third year.—Grain, seeded down, 8 lbs. red clover, 2 lbs. alsike, 10 to 12 lbs. timothy per acre.

Fourth year.—Clover hay, two crops expected.

Fifth year.—Timothy hay.

Rotation 'B.'

First year.—Grain, land ploughed previous autumn. Seeded down 10 lbs. red clover, 2 lbs. alsike, 5 lbs. timothy per acre.

Second year.—Clover hay, two crops expected.

Third year.—Corn, manured in winter, 20 to 25 tons per acre; spring ploughed.

Fourth year.—Grain, seeded down, red clover 10 lbs. alsike 2 lbs. and 5 lbs. timothy per acre. Land fall-ploughed after corn; very shallow furrow.

Fifth year.—Clover hay, two crops; late fall ploughed.

Rotation 'E.'

First year.—Manured and handled as 'Z.'

Second year.—Oats, seeded down, 10 lbs. red clover, 6 lbs. alfalfa, 2 lbs. alsike, 6 lbs. timothy per acre.

Third year.—Pasture. Cattle.

Rotation 'Z.'

First year.—Manure, 12 to 15 tons per acre, applied winter; shallow ploughed in spring; well worked and planted to corn.

Second year.—Oats, seeded down, 10 lbs. red clover, 2 lbs. alsike, 6 lb. alfalfa and 6 lbs. timothy per acre.

Third year.—Clover hay; two crops expected.

Rotation 'S.'

Shallow ploughing; deep cultivation by means of stiff tooth cultivator or subsoiler.

First year.—Roots or corn, ploughed August, 4 inches deep; manure 15 to 20 tons per acre; work at intervals, ridge up in fall, sow to roots in spring.

Second year.—Grain, seeded down, 10 lbs. red clover, 12 lbs. timothy per acre.

Third year—Clover hay.

Fourth year.—Timothy hay.

'Rotation 'D.'

Deep ploughing; plough August, 7 inches deep; manure 15 to 20 tons per acre; work with cultivator at intervals. Land ploughed late autumn, 7 inches; roots or corn next spring.

Second, third and fourth year.—Same as 'S.'

Rotation 'H.'

First year.—Manured in fall and manure ploughed in, well worked; sown to roots next spring.

Second year.—Different grain mixtures suitable for feeding green. Different grass seed mixtures suitable for pasture and soiling next year.

Third year.—Pasture. Swine.

Rotation 'T.'

Sheep pasture.

Crops just as in 'S' save that various mixtures of grain and grass seed are used to test their value for sheep feeding and pasturing.

Rotation 'A' Fertilizer.

Using barn-yard manure only. Four years duration. Roots, grain, hay, hay. Barn-yard manure 15 tons per acre for roots.

Rotation 'B' Fertilizer.

Commercial fertilizer but no barn-yard manure. Four years' duration. Roots, grain, hay, hay. Commercial fertilizer: 300 lbs. superphosphate; 75 lbs. muriate of potash; 100 lbs. nitrate of soda, before sowing to roots. Each other year 100 lbs. nitrate of soda only.

Rotation 'C' Fertilizer.

Half usual dressing barn-yard manure and commercial fertilizer besides. Four years' duration. Roots, grain, hay, hay. Barn-yard manure 7½ tons per acre for roots; commercial fertilizer at same time, 150 lbs. superphosphate; 37½ lbs. muriate of potash and 50 lbs. nitrate of soda. Besides, 100 lbs. nitrate of soda each year in hay or grain.

RETURNS PER ACRE.

To compare results under such varied crop and cultural conditions is a rather difficult matter. The plan adopted has been to place an arbitrary and uniform valuation on all products and on pasturing various classes of stock. Following this plan, the returns per acre have been about as follows, the average of six years' work, save in cases of fertilizers 'A,' 'B' and 'C,' which are for one year only.

Rotation 'A.'

Average value of crop per annum—$22.79.

Rotation 'B.'

Average value of crop per annum—$23.10

Rotation 'E.'

Average value of crop per annum—$21.04.

Rotation 'Z.'

Average value of crop per annum—$25.43.

Rotation 'S.'

Average value of crop per annum— $25.59.

Rotation 'D.'

Average value of crop per annum—$25.45.

Rotation 'H.'

Average value of crop per annum—$28.43.

Rotation 'T.'

Average value of crop per annum—$19.55.

Rotation 'A' Fertilizer.

Average value of crop per acre—$26 13.

Rotation 'B' Fertilizer.

Average value of crop per acre—$27.61.

Rotation 'C' Fertilizer.

Average value of crop per acre—$28.44.

PROFITS PER ACRE.

The values placed on products were: Roots or silage stored, $2 per ton; hay, $7 per ton; grain, $1 per 100 lbs.; oat straw, $4 per ton; pasturing cows, $1 per month. Sheep and swine pastured, one cent per day.

In estimating cost of operation, labour is charged at prices paid, machinery is put at 30 cents per acre, rent at $3 per acre and manure at $3 per acre.

The average net profits, after paying all expenses, were as follows per acre:—

'A' net profit per acre	$8 78
'B' " "	8 70
'E' " "	7 26
'Z' " "	9 34
'S' " "	7 46
'D' " "	7 42
'H' " "	8 05
'T' " "	3 78
'A' Fertilizer net profit per acre	6 27
'B' Fertilizer " "	5 32
'C' Fertilizer " "	7 33

VALUE OF DIFFERENT ROTATIONS.

A study of the various rotations would lead one to remark upon them briefly as follows:—

Rotation 'A.'—This rotation has been in use here for 12 years and has proven to be most excellent where carefully followed and cultural operations well performed.

Where all land was under cultivation, it would be found necessary to devote a certain area to soiling crops. It might be extended to six years by leaving down to pasture for two years instead of one.

Rotation 'B.'—This rotation has been fairly successful here, but, for certain reasons not easily enumerated, I do not feel as though I could either criticise or praise as yet and feel sure of my ground.

Rotation 'E.'—This rotation would not be suitable for the average farmer but might suit the man who had to buy rough forage.

Rotation 'Z.'—This would be a most excellent rotation to put into practice where sufficient rough land was available to serve as pasture. It is the rotation that would most likely supply the greatest amount of forage of the best description for dairying or beef production. It is better suited for heavy than for light soils.

Rotation 'S.'—This is a rotation that has been in use for a number of years on the Agricultural College Farm at Guelph, where it has given satisfactory results. It is possibly open to the criticism of having too small a proportion of land under grain. Where live stock is, however, the mainstay, this is a very minor fault. The turning of a shallow furrow when ploughing sod has been found to be good practice here when preparing for grain or corn. In preparing for roots, the regular plough with subsoiler is to be advised.

Rotation 'D.'—This rotation is the same as rotation 'S' so far as crops are concerned. The results so far obtained show the advantage in favour of either shallow ploughing and deep cultivation or deep ploughing.

Rotation 'H.'—The area devoted to pigs (some 10 acres) where this rotation is followed has given very satisfactory returns, and would, I feel confident, prove profitable to any one who followed it carefully.

Rotation 'T.'—Sheep. The returns from this rotation are not strictly comparable with those from others, since many side experiments materially affect the results. It has, however, proven very satisfactory for this class of stock.

As already stated, the rotation experiments have been under way for five years now. Three out of the five years have been what might be called 'lean years' in the Ottawa valley, hence these rotations can hardly be said to have yet shown what they are capable of doing in the way of influencing crop production.

The few facts given above are, however, strictly comparable each with the others, excepting possibly 'T' or sheep, where some rather disturbing conditions have been introduced.

THE ROTATIONS IN 1910.

The experiment to determine the values of the different rotations as discussed above is being followed up, and below the detailed report of the labour on each plot and the return therefrom, will be found some brief notes on each field and on the rotation as a whole.

The rotations are as follows:—

Rotation 'A.'—Five years. Clover hay, timothy hay, grain, corn, grain.

Rotation 'B.'—Five years. Clover hay, grain, clover hay, corn, grain.

Rotation 'E.'—Three years. Pasture, corn, grain.

Rotation 'Z.'—Three years. Clover hay, corn, grain.

Rotation 'S.'—Four years. Shallow ploughing, clover hay, timothy hay, roots, grain.

Rotation 'D.'—Four years. Deep ploughing, clover hay, timothy hay, roots, grain.

Rotation 'H.'—Three years. Hog pasture, roots, grain or soiling crops.

Rotation 'T.'—Four years. Sheep pasture, roots and soiling crops, grain, clover hay.

Rotation 'A' Fertilizer.—Four years. Roots, grain, hay, hay. (Barn-yard manure).

Rotation 'B' Fertilizer.—Four years. Roots, grain, hay, hay. (Commercial fertilizer).

Rotation 'C' Fertilizer.—Four years. Roots, grain, hay, hay. (Commercial fertilizer and barn-yard manure).

In the descriptions of the rotations and fields that follow, an effort is made to give as concisely as possible the location of each field, its size, the character of its soil, its drainage and its general crop history.

In the tables will be found all items of expenditure. The manure is applied in the same ratio to each field in each rotation. To illustrate: If to the corn land in rotation 'Z,' 15 tons of manure per acre is applied, this is equivalent to 5 tons per acre per annum, as 'Z' is a three-year rotation. Then, in applying manure to 'B' 25 tons would be applied, as 'B' is a five-year rotation. Since manure must vary in quantity each year, $3 per acre per annum is charged in each rotation.

COMPARATIVE VALUES OF ROTATIONS ON STOCK FARMS.

Supposing the average animal of the bovine species to consume 2,000 lbs. hay, 6 tons ensilage and roots, 1 ton straw, 4 month pasture and 1,000 lbs. meal in a year, this would amount to about $37 or $38 as the cost of feeding an animal for a year. Keeping these figures in mind, the stockman can form some idea of the comparative values of the different rotations for live stock farming.

ROTATION

Lot.	Location.	Description of Soil.							Area in Acres.	Crops.		Items of	
		Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.		1909.	1910.	Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
A 1	W.S. 3	30	45	....	....	25	....	....	9·96	Hay	Grain	59 76	15 64
A 2	L.S. 1	30	65	5	....	....	....	....	8·90	Hay	Hay	53 40	11 57
A 3	A.S. 14	10	15	20	20	15	....	20	10·20	Grain	Corn	61 20	18 26
A 4	W.P.G.S. 1. F.S. 1	}70	20	10	....	....	....	....	8·89	Grain	Hay	53 34	11 55
A 5	F.S.B. 3	...	35	30	10	15	10	....	8·56	Corn	Grain	51 36	13 22
	Aggregate								46·51			279 06	70 24
	Average per acre in 1910											6 00	1 51
	Average for six years											6 00	1 56

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	1909.	1910.	Rent and Manure.	Seed, Twine and use of Machinery.
B 1	W.S. 4	5	35	5	50	5	....	....	10·00	Corn	Grain	60 00	15 80
B 2	L.S. 2	20	70	....	5	5	....	....	8·83	Hay	Grain	52 98	13 26
B 3	A.S. 15	20	60	5	....	15	....	....	10·20	Grain	Hay	61 20	13 26
B 4	W.P.G.S. 2	20	60	15	....	5	....	....	9·15	Grain	Hay	54 90	11 89
B 5	F.S. 2	...	30	30	40	....	....	....	8·93	Hay	Corn	53 58	16 10
	Aggregate								47·11			282 66	70 31
	Average per acre in 1910											6 00	1 49
	Average for six years											6 00	1 51

Rotation 'A.'

This rotation of five years' duration includes grain, hay (two years), grain and corn or roots, in order named. The grain crop mentioned first, comes after corn. With the first crop of grain is sown 10 lbs. red clover, 1 lb. alsike and 10 lbs. timothy per acre. The field is left in hay for two years; then in August of the second year it is ploughed and cultivated at intervals till October, when it is ridged up and left till next spring. Oats are sown on this field, and with them red clover seed at the rate of 10 lbs. per acre. This clover is allowed to grow for something over a year, or until corn seeding time the following spring, when it is turned under with a shallow furrow along with the manure that will have been applied during the winter. After the corn has been harvested, the land is ploughed shallow and left till next spring.

The crops on this rotation have been fairly satisfactory this year.

From 'A 1' a good crop of grain was harvested. 'A 2' was in hay and only gave a fair crop. On 'A 3' the crop grown was corn and gave a good yield. 'A 4' was in hay, but, on account of dry weather, the second crop was light, bringing the yield somewhat below the average. On 'A 5' a very good crop of oats was grown.

"A."

Expense in raising Crop in 1910.								Particulars of Crop in 1910.							
Manual Labour.		Horse Labour.													
No. of Hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per Acre.	Profit per Acre in 1910.
Hrs.	$ cts.	Hrs.	Hrs.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
35	5 25	...	185½	54 81	12 31	147 77	14 83	17,593	18,767	....	....	213 46	21 43	6 60
50	7 50	6	25¼	9 07	....	81 54	9 17	......	......	38,790	....	135 76	15 25	6 08
319	52 35	17	184	63 50	......	195 31	19 14	....	.....	....	299,240	299 24	29 33	10 19
74	11 10	10½	48	17 02	....	93 01	10 46	. ..	......	60,220	....	210 77	23 70	13 24
32	4 80	....	84	30 84	13 53	113 75	13 28	19,334	21,301	....	....	235 94	27 56	14 28
540	81 00	33½	526¾	175 24	25 84	631 38	. .. .	36,927	40,068	99,010	299,240	1,095 17	......	.. ...
11·6	1 74	·7	11·1	3 76	0 55	......	13 56	794	861	2,128	6,433	....	23 54	9 98
14·3	2 26	4·1	10·1	4 16	0 33	.....	14 47	629	759	1,899	6,142	....	22 78	8 78

"B."

40	6 00	....	92½	33 21	13 18	128 19	12 81	18,840	22,960	....	....	234 32	23 43	10 62
28	4 20	....	108	35 81	8 71	115 00	13 03	12,454	12,566	....	....	149 67	16 96	3 93
75	11 25	11½	52½	18 62	.....	104 33	10 22	. ...	.....	61,670	....	215 84	21 16	10 94
83	12 85	8½	51	18 44	.....	97 68	10 67	......	......	70,980	....	248 43	27 15	16 48
290	43 50	73	181	76 87	......	190 05	21 28	......	......	....	231,450	231 45	25 91	3 63
516	77 80	93	488	182 95	21 89	635 25	......	31,294	35,526	132,650	231,450	1,079 71	......	.... .
10·9	1 65	1·9	10·35	3 88	0 46	......	13 48	664	754	2,815	4,912	....	22 91	9 44
12·7	2 48	4·7	9·6	4 32	0·33	......	14 72	586	950	2,499	6,011	.. ...	23 11	8 70

Rotation 'B.'

This rotation of five years' duration includes grain, hay, grain, hay and corn or roots in the order named, the first crop of grain following a crop of corn or roots. Red clover, 10 lbs.; alsike, 1 lb. and timothy, 5 lbs., is sown with grain each time. When grain follows hay, the land is ploughed in the early fall. When corn follows hay the land is ploughed in the spring, the spring growth of grass and clover being ploughed in along with the manure which will have been applied during the preceding winter.

The crops on this rotation were fairly satisfactory.

'B 1' was in grain (Banner oats) and gave a fair crop.

'B 2' was in grain also, but only returned a light crop.

From 'B 3' a good crop of hay was harvested.

'B 4' was also in hay and returned a very good crop.

On 'B 5' the crop grown was corn and gave a fair yield.

ROTATION

Lot.	Location.	Description of Soil.							Area in Acres.	Crops.		Items	
		Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.				Rent and manure.	Seed, twine and use of machinery.
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	Ac.	1909.	1910.	$ cts.	$ cts.
E 1........	W.S. 1......	40	40	....	....	15	5	....	14·00	Pasture....	Corn......	84 00	23 90
E 2........	L.S. 4......	10	60	....	10	20	....	....	13·75	Grain	Pasture....	82 50	13 75
E 3........	Morn.......	30	60	5	....	....	5	....	13·80	Corn. ...	Grain......	82 80	22 74
		Aggregate................							41·55	....	....	249 30	60 39
		Average per acre in 1910..........								....	....	6 00	1 45
		Average for six years. ...								....	....	6 00	1 74

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	1909.	1910.	Rent and manure.	Seed, twine and use of machinery.
Z 1.... ...	W.S, 2......	40	40	....	....	15	5	....	6·00	Hay.	Corn...	36 00	11 00
Z 2........	L.S 3.....	10	60	10	....	20	....	....	5 81	Grain......	Hay.......	34 86	7 55
Z 3........	Obs........	10	60	20	10	....	....	....	4·20	Corn..	Grain......	25 20	6 66
		Aggregate................							16·01	....	....	96 06	25 21
		Average per acre in 1910.....								....	....	6 00	1 57
		Average for six years.....								....	....	6 00	1 73

Rotation 'E.'

This rotation of three years' duration includes grain, pasture and corn.

The grain comes after the corn, the stubble of which is treated as described under rotation 'A.' With the grain in the spring is sown 10 lbs. red clover, 2 lbs. alsike, 6 lbs. alfalfa and 6 lbs. timothy seed per acre. If weather permits, the field is pastured slightly in the fall.

After the grain crop the land is pastured, the grass seeding having been done with this object in view. In estimating the value of the returns from this field pasture is charged at $1 per month per cow. At this rate the returns fall very far short of what would have been the returns if a hay crop had been harvested, if we may judge by the returns from 'Z.' This rotation and rotation 'Z' were introduced into the list in order to gain some idea as to the difference in returns probable from land pastured and land from which all the crops are harvested. It was expected that the corn crop after the pasture would in a measure make up for the difference in favour of the no-pasture rotation 'Z,' but the returns are on the whole a good deal short of those from 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover and grass in the spring.

Crops were all good on this rotation in 1910.

"E."

of Expense in Raising Crop in 1910.								Particulars of Crop 1910.						
Manual labour.		Horse labour.												
Hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one Acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per Acre.	Profit per Acre in 1910.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts	$ cts.	$ cts.
537	80 55	18	278	93 54	.....	281 99	20 14	......	......	......	477,400	477 40	34 10	13 96
......	....	...	...	......	......	96 25	7 00	.....	......	......	....	137 50	10 00	3 00
52	7 80	4	99½	37 84	17 60	168 78	12 23	25,149	27,601	......	....	306 69	22 22	9 99
589	88 35	22	377½	131 38	17 60	547 02	......	25,149	27,601	......	477,400	921 59	......	......
14·1	2 12	·5	9·1	3 16	0 42	... ..	13 16	605	664	......	11,489	....	22 18	9 01
15·7	1 88	2·4	9·4	5 65	0 39	......	14 38	563	779	......	9,189	....	23 43	7 26

"Z."

180	27 00	8	114½	40 70	......	114 70	19 11	......	......	......	204,400	204 40	34 06	14 95
54	8 11	4½	32	10 72	.....	61 23	10 53	......	......	38,730	....	135 55	23 33	12 80
18	2 70	.....	55½	18 78	7 32	60 66	14 44	10,471	8,729	.....	....	122 16	29 08	14 64
252	37 81	12½	202	70 20	7 32	236 59	....	10,471	8,729	38,730	204,400	462 11	......	......
15·7	2 36	·7	12·6	4 38	0 45	......	14 77	654	545	2,419	12,767	....	28 86	14 09
16·2	2·70	5.1	8·9	3 83	0 27	.... .	12 93	544	768	2,142	9,895	. ....	24 54	9 34

Rotation 'Z.'

This rotation of three years' duration includes corn, grain and clover hay in the order named.

Corn comes after the clover hay. The manure is applied during the fall or during the winter and spring, and the clover allowed to grow up through it, so facilitating the turning under of the whole mass of manure, late fall growth and spring growth of clover a few days before the corn is to be sown. The furrow turned is quite shallow, about five inches deep, and the land is then disc-harrowed and the corn sown in rows 42 inches apart. It receives later the usual cultivation and care.

Grain follows corn, the land having been ploughed in the fall. With the grain there is sown 10 lbs. red clover, 2 lbs. alsike, 6 lbs. alfalfa and 6 lbs. timothy seed per acre. The hay is cut twice and the last aftermath allowed to grow up to be turned under the next spring for corn. Such a rotation would be particularly valuable to a farmer having sufficient rough land for pasture, or to one desirous of keeping as many cattle as possible on the land at his disposal, supposing him willing to grow roots and corn.

Crops on this rotation were all good in 1910.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	Crops. 1909.	1910.	Items of Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1909.	1910.	$ cts.	$ cts.
S 1........	E.P.G.S. 1..	20	80	....	....	....	....	....	2	Hay......	Hay........	12 00	2 60
S 2.....	E.P.G.S. 3..	20	80	....	....	....	....	....	2	Hay........	Corn........	12 00	3 70
S 3........	E.P.G.S. 5..	30	70	....	....	....	....	....	2	Roots	Grain	12 00	3 15
S 4........	E.P.G.S. 7..	60	40	....	....	....	....	....	2	Grain	Hay..	12 00	2 60
	Aggregate........								8	....	....	48 00	12 05
	Average per acre in 1910........								.....	....	....	6 00	1 50
	Average for six years........								.....	....	....	6 00	1 28

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	1909.	1910.	Rent and manure.	Seed, twine and use of machinery.
D 1........	E.P.G.S. 2..	20	80	....	....	....	....	....	2	Hay..	Hay........	12 00	2 60
D 2	E.P.G.S. 4..	20	80	....	....	....	....	....	2	Hay.......	Corn........	12 00	3 70
D 3.......	E.P.G.S. 6..	30	70	....	....	....	....	....	2	Roots	Grain	12 00	3 15
D 4........	E.P.G.S. 8..	60	40	....	....	....	....	....	1·56	Grain	Hay..	9 36	2 02
	Aggregate........								7·56	....	....	45 36	11 47
	Average per acre in 1910........								.....	....	....	6 00	1 51
	Average for six years........								.....	....	....	6 00	1 26

Rotation 'S.'

(Shallow Ploughing).

This rotation is of four years' duration and includes grain, two years' hay, roots or corn.

The grain crop follows the hoed crop, the land being ploughed (or cultivated) to a depth of about four inches after the hoed crops are harvested in the fall. With the grain is sown 10 lbs. red clover and 12 lbs. timothy seed per acre. The clover hay is cut twice in the season and the second aftermath left on the field; that is, it is not pastured off as is usually done. In the second hay year, two crops are cut if possible, and the land ploughed in August with a shallow four-inch furrow. If manure is applied before ploughing, a subsoiler is attached to the plough to loosen up the soil to a depth of 8 or 9 inches. If manure is not applied, this end is attained by means of a strong, deep-reaching cultivator after the sod has rotted in the fall or the next spring.

'S 1' was under hay this year and gave a fairly good crop.

'S 2' was under corn and returned only a fair crop.

'S 3.' From this field a light crop of grain was harvested which had suffered somewhat from drought.

'S 4' gave an excellent crop of hay.

"S".

Expense in Raising Crop in 1910. Manual Labour. Hours.	Cost of manual labour.	Horse Labour. Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one Acre.	Particulars of Crop in 1910. Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per Acre.	Profit per Acre in 1910.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
16	2 40	2¼	7¼	2 73	......	19 73	9 86	......	.....	10,570	... .	36 99	18 49	8 63
57	8 55	2½	65	20 81	....	45 06	22 53	.....	...	....	59,460	59 46	29 73	7 20
4½	0 67	...	16¾	5 76	2 22	23 80	11 90	3,180	3,830	....	... .	39 46	19 73	7 83
17½	2 62	3	9½	3 60	......	20 82	10 41	.....	. ...	14,580	....	51 03	25 51	15 10
95	14 24	7¾	98½	32 90	2 22	109 41	......	3,180	3,830	25,150	59,460	186 94	......	....
11·8	1 78	·97	12·3	4 11	0 27	.... .	13 67	397	478	3,143	7,432	....	23 36	9 69
37·3	5 53	5·6	11·3	5 25	0 21	...	17 97	568	548	3,004	10,273	....	25 59	7 46

"D".

16	2 40	2¼	7¼	2 73	......	19 73	9 86	......	.....	10,290	....	36 01	18 00	8 14
57	8 55	2½	78½	24 86	......	49 11	24 55	......	......	....	60,860	60 86	30 43	5 88
4½	0 67	....	16¾	5 76	2 17	23 75	11 87	3,107	3,473	....	....	38 01	19 00	7 13
14	2 10	2	8¼	2 97	....	16 45	10 54	... ..	. ..	12,450	....	43 57	27 92	17 38
91½	13 72	6¾	110¾	36 32	2 17	109 04	....	3,107	3,473	22,740	60,860	178 45	......	......
12·1	1 81	·89	14 6	4 80	0 28	....	14 42	410	459	3,007	8,050	. ...	23 60	9 18
32·4	5 58	4·7	12·0	6 08	0 19	......	18 21	595	536	2,982	10,455	....	25 47	7 42

Rotation 'D.'

(Deep Ploughing).

This rotation is of four years' duration and includes grain, two years' hay and corn or roots.

The grain crop follows hoed crop, the land being ploughed to a depth of about seven inches, or cultivated after the hoed crops are harvested in the fall. With the grain is sown 10 lbs. red clover and 12 lbs. timothy seed per acre. The clover hay is cut twice in the season, and the second aftermath left on the field; that is, it is not pastured off as is usually done. In the second hay year two crops are cut if possible, and the land ploughed in August with a deep seven-inch furrow.

'D 1' was under hay this year and gave a fairly good crop.

'D 2' was under corn and only returned a fair crop.

'D 3.' From this field a light crop of grain was harvested suffering somewhat from drought.

'D 4' gave an excellent crop of hay.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	Crops. 1909.	1910.	Items of ... Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1909.	1910.	$ cts.	$ cts.
H 1........	H.S. 1......	30	40	20	10	....	....	...	3·35	Grain	Pasture.....	20 10	3 35
H 2........	H.S. 2......	25	45	20	10	....	....	....	3·15	Pasture.....	Roots	18 90	4 09
H 3	H.S. 3......	10	20	50	20	..	....	....	2·85	Roots	Hay........	17 10	3 70
		Aggregate..................							9·35	....	....	56 10	11 14
		Average per acre in 1910........								.....	....	6 00	1 18
		Average for 6 years..............								....	....	6 00	1 09

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	1909.	1910.	Rent and manure.	Seed, twine and use of machinery.
T 1........	S.S. 1	10	90	....	...	....	....	....	1·51	Hay........	Hay..	9 06	1 96
T 2	S.S. 2	15	85	...	...	....	....	....	2·73	Roots	Hay..	16 68	3 61
T 3........	S.S. 3	...	100	...	..	...	..	...	3·33	Pasture. ...	Pasture.....	19 98	3 33
T 4........	S.S. 4......	15	85	....	....	....	....	....	2·50	Pasture....	Roots	15 00	3 25
		Aggregate							10·12	....	....	60 72	12 15
		Average per acre in 1910...........								....	....	6 00	1 19
		Average for 6 years.								....	....	6 00	1 37

Rotation 'H.'

(Hog Farm.)

This rotation is of three years' duration, and includes soiling crop and pasture in the order named. The land is ploughed late in the fall after it has been manured. It is disced the next spring and the roots sown on ridges. The roots receive the usual cultivation and are of varied character, including mangels, sugar mangels, sugar beets and turnips, devoted to pork production for the most part, the surplus being charged to cattle and the returns invested in meal for pig feeding.

The soiling crop field is sown with various crops suitable for feeding to pigs. What is over and above the amount possible of consumption by pigs is charged to the cattle at $2 per ton and the returns used to purchase meal for pork production.

The pasture area is divided into several parts, the seeds being sown, as far as possible, at the same time as the soiling crops the previous year, and not allowed to be eaten too close the first fall, although any good growth is not wasted.

'H 1.'—This plot was used for pasture.

'H 2.'—Was under roots (mangels) and a good crop was harvested.

'H 3.'—From this field a very good crop of peas and oats was harvested, part of which was cut for green feed and part for hay.

'H'.

Expense in Raising Crop in 1910.								Particulars of Crop 1910.						
Manual labour.		Horse labour.												
Hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one Acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per Acre.	Profits per Acre in 1910.
No.	$ cts.	No.	No.	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
......	.....	....	....	......	.....	23 45	7 00	....	.....	......	....	33 50	10 00	3 00
173	25 95	29	78	30 95	......	79 89	25 36	......	....	......	137,950	137 95	43 79	18 43
22	3 30	3	31½	11 28	....	35 38	12 41	......	......	180,70	....	63 24	22 18	9 77
195	29 25	32	109½	42 23	......	138 72	....	......	......	180,70	137,950	234 69	......	....
20·8	3 12	3·4	11·7	4 51	.....	. .	14 83	.....	......	1,932	14,754	. . .	25 10	10 27
38·4	4 27	5·1	9·4	4 27	14	.....	14 22	167	377	462	17,826	....	28 43	8 05
'T'.														
5	75	1	4	1 45	.....	13 22	8 75	......	......	5,300	....	18 55	12 28	3 53
20	3 00	2	35½	12 11	......	35 40	12 73	....	......	16,680	....	58 38	21 00	8 27
.....	.....	....	....	.....	......	23 31	7 00	......	......	.....	....	33 33	10 00	3 00
218	32 70	8	70	25 52	......	76 46	30 58	......	......	......	100,530	100 53	40 21	9 63
243	36 45	11	109½	39 08	....	148 39	......	....	......	21,980	100,530	210 79	......	. . .
23·8	3 60	1·0	10·8	3 86	....	. ...	14 66	.....	......	2,172	9,933	. .....	20 82	6 16
27·3	4 03	4·5	9·3	3 97	.....	......	15 27	......	282	16·80	8,774	....	19 55	3 78

Rotation 'T.'

(Sheep Farm.)

This rotation of four years' duration includes roots, grain, hay and pasture.

The area devoted to sheep farming is rather limited, about 11.06 acres. This area is not included in the '200-acre' farm. The whole area has been for several years devoted to pasturing sheep, but it has been divided into four rather unequal fields, susceptible of further subdivision, and devoted to a rotation considered suitable for sheep.

The root field is devoted to white turnips, swedes, cabbage, kohl rabi, thousand-headed kale, etc. It comes after the pasture, the land being manured and ploughed in the fall.

Grain follows on the root land, and with the grain various clovers and grass seeds are sown to prepare for the ensuing two years. The grain may be harvested or used for soiling crop for sheep. The hay field is expected to give one crop of hay and then be devoted to pasture for lambs as soon as they are weaned.

The pasture field is the field that has been in hay the previous year. Alfalfa, red clover, alsike clover, brome grass (*bromus inermis*) and timothy are the clovers and grasses used.

The crops on this rotation were fair this year.

FERTILIZER

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Hardpan.	Gravel.	Area in Acres.	Crops. 1909.	1910.	Items Rent and Manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.	1909.	1910.	$ cts.	$ cts.
A 1........	A. S. 2....	....	25	75	....	....	....	....	1	Grain......	Hay..	5 25	1 30
A 2........	A. S. 5...	....	25	75	....	....	....	....	1	Hay..	Roots	5 25	1 30
A 3........	A. S. 8....	....	....	10	....	90	...	....	1	Corn......	....	......	......
A 4...	A. S. 11....	....	....	20	....	80	....	....	1	Hay.. ...	Roots.....	5 25	1 30
	Aggregate........								4	....	....	15 75	390
	Average per acre in 1910..								....	....	....	5 25	1 30
	Average per acre for 2 years								.....	....	....	5 25	1 38

FERTILIZER

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Hardpan.	Gravel.	Area in Acres.	1909.	1910.	Rent and Manure.	Seed, twine and use of machinery.
B 1........	A. S. 3....	....	25	75	...	...	....	...	1	Grain......	Hay.......	7 50	1 30
B 2.......	A. S. 6....	..	5	85	....	10	....	....	1	Hay.......	Roots.....	7 50	1 30
B 3.... ...	A. S. 9....	..	....	....	....	100	. .	..	1	Corn.... .	....	......	.....
B 4...	A. S. 12 ...	....	....	50	....	50	....	....	1	Hay.......	Roots	7 50	1 30
	Aggregate...... ..								4	.. ..	....	22 50	3 90
	Average per acre in 1910.								....	....	... .	7 50	1 30
	Average per acre for 2 years.								.. ..	....	....	7 50	1 30

FERTILIZER

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Hardpan.	Gravel.	Area in Acres.	1909.	1910.	Rent and Manure.	Seed, twine and use of machinery.
C 1.	A. S. 4....	....	25	75	...	....	..	....	1	Grain......	Hay.. ...	6 60	1 30
C 2.	A. S. 7....	....	....	70	...	30	...	....	1	Hay..... .	Roots.....	6 60	1 30
C 3.	A. S. 10....	....	....	....	....	100	....	...	1	Corn.......	....	.... .	.....
C 4.	A. S. 13....	....	....	30	...	....	50	20	1	Hay........	Roots......	6 60	1 30
	Aggregate..........................								4	....	....	19 80	3 90
	Average per acre in 1910..........								......	....	....	6 60	1 30
	Average per acre for 2 years.								......	....	....	6 60	1 38

ROTATION 'A.'

of Expense in Raising Crops in 1910.								Particulars of Crops in 1910.						
Manual labour.		Horse labour.												
Hours.	Cost of manual labour.	No. of hours with single horse.	No. of hours with team.	Value of horse labour	Threshing.	Total cost.	Cost per acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crops per Acre.	Profit per Acre in 1910.
No.	$ cts.	No.	No.	$ cts.	cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
8½	1 27	1½	6	2 17	......	10 74	10 74	......	......	6,900	......	24 15	24 15	13 41
133½	20 02	10	16½	7 93	......	34 50	34 50	......	......	....	35,950	35 95	35 95	1 45
133½	20 02	10	16½	7 93	......	34 50	34 50	....	......	.. ..	37,570	37 57	37 57	3 07
275½	41 31	21½	39	18 03	......	79 74	......	......	.....	6,900	73,520	97 67	......	....
91·8	13 77	7·1	13	6·01	......	.....	26 58	.....	...	2,300	24,506	....	32.55	5 97
50·8	7·70	4·0	12·9	5·26	13 5	.....	19 86	182	340	2,305	15,570	....	26 13	6 27

ROTATION 'B.'

10	1 50	1½	6	2 17	......	12 47	12 47	.. ..	......	7,230	....	25 30	25 30	12 83
111	21 15	10	16½	7 93	......	37 88	37 88	......	......	....	40,726	40 72	40 72	2 84
136	20 40	10	16½	7 93	... .	37 13	37 13	......	......	....	37,550	37 55	37 55	·42
287	43 05	21½	39	18 03	......	87 48	.....	......	......	7,230	78,276	103 57	......	....
95·6	14 35	7·1	13	6 01	......	......	29 16	......	. .	2,410	26,094	... .	34 52	5 36
52·7	7 99	4 0	12·9	5 26	14·5	......	22 29	202	342	2,355	16,582	....	27 61	5 32

ROTATION 'C.'

10	1 50	1½	6	2 17	......	11 57	11 57	......	......	7,860	....	27 51	27 51	15 94
135	20 25	10	16½	7 93	.. . .	36 08	36 08	......	.....	....	42,960	42 96	42 96	6 88
135	20 25	10	16½	7 93	......	36 08	36 08	......	......	......	38,330	38 33	38 33	2 25
280	42 00	21½	39	18 03	......	83 73	......	.....	......	7,860	81,290	108 80	......	.....
93·3	14 00	7·1	13	6 01	. .	......	27 91	......	. ....	2,620	27,096	....	36 26	8 35
51·5	7·82	4·0	12·9	5 26	14	......	21·21	197	347	2,579	16,853	.. ....	28 44	7 33

'A.'—This rotation is of four years' duration and includes grain, hay two years, roots. The grain follows roots, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs. alsike and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year, two crops are cut if possible. Then the land is manured at the rate of 15 tons, barn-yard manure, per acre, and ploughed in August 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and sown to roots.

'B.'—This rotation is of four years' duration and includes grain, hay two years, and roots. The grain follows roots or corn, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs. alsike and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year, two crops are cut if possible. Then the land is ploughed in August 5 inches deep and worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and 300 lbs. superphosphate, 75 lbs. muriate of potash and 100 lbs. nitrate of soda is applied before being sown to roots or corn. In addition to the above, the land receives a dressing of 100 lbs. nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass and just as the grain is coming through, when under grain.

'C.'—This rotation is four years' duration and includes grain, hay two years, roots. The grain follows the roots or corn, the land being ploughed or cultivated in the fall after the hoed crop is harvested. With the grain is sown 8 lbs. red clover, 2 lbs. alsike and 12 lbs. timothy per acre. The clover hay is cut twice in the season. In the second hay year, two crops are cut if possible; then the land is manured at the rate of 7½ tons barn-yard manure per acre and ploughed in August 5 inches deep, worked at intervals during the autumn and ribbed up in the late fall. The following spring the land is worked into good tilth and 150 lbs. superphosphate, 37½ lbs. muriate of potash and 50 lbs. nitrate of soda is applied before being sown to roots. In addition to the above the land receives a dressing of 100 lbs. nitrate of soda per acre each year that the field is in hay or grain. This application is given in early spring on the grass and just as the grain is coming through, when under grain.

REPORT OF THE DOMINION HORTICULTURIST

W. T. MACOUN.

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-fourth Annual Report of the Horticultural Division.

While all the work done in this Division is not recorded in this report, the results from some of the most important experiments being conducted are given, with other material which it is hoped will prove of value.

Previous to this year, my work as Horticulturist of the Central Experimental Farm was confined mainly to the provinces of Ontario and Quebec, and the Central Experimental Farm at Ottawa. This year the title of the position was changed to Dominion Horticulturist and a wider field of work was opened. In addition to my work at Ottawa, I was instructed to visit the Branch Farms from time to time as necessary and discuss, in consultation with the Superintendents, the experiments being conducted with fruits, garden vegetables, forest and ornamental trees, shrubs and herbaceous plants.

In order to provide the assistance which was required on account of this greater field of work, Mr. T. G. Bunting, B.S.A., was appointed my Assistant in August, 1910, and has been able to render substantial and valuable help since.

I visited the branch Experimental Farms and Stations at Brandon, Man., Indian Head, Sask., Rosthern, Sask., Lacombe, Alta., Lethbridge, Alta., Agassiz, B.C., Charlottetown, P.E.I., and Nappan, N.S., during the growing season and went carefully over the plantations, making suggestions for future experiments and taking notes in regard to future work. I also visited the new Stations at Scott, Sask., Kentville, N.S., and Cap Rouge, Que., and the sub-station at Kamloops, B.C.

During the past winter, I have worked out a uniform system of recording notes of horticultural experiments at the branch Farms which it is hoped will add to the usefulness of the information obtained.

Material for the new Stations at Scott and Cap Rouge and additional stock for some of the other Farms has been ordered for next season.

I have the honour to be, sir,
Your obedient servant,
W. T. MACOUN,
Dominion Horticulturist.

CHARACTER OF SEASON.

The frost was out of the ground enough to dig in the nursery at the Central Experimental Farm by March 28, 1910, and the upper part of the orchard could have been ploughed on that date. The average date when the frost had been out enough to dig for the previous twelve years was April 11, although, leaving out the two exceptionally early years 1902 and 1903, the average date for the remaining ten years is April 14. The season up to the end of April was earlier than the average. The highest temperature in April was 76° Fahr., on the 5th, and the lowest 22° Fahr. on the 13th. May was a rather cool month on the whole and comparatively late. The highest temperature was 79·5° Fahr. on the 29th and the lowest 34° Fahr. on the 13th. No frosts were recorded during the month of May and, although the lowest temperature recorded in June was 32·5° Fahr., on June 4, frost affected crops that night. Strawberry flowers were much injured. The foliage of tomato plants was frozen and the plants in most cases killed to the ground. Grapes were more or less injured on the Farm and, in some parts of Ottawa, the crop was destroyed. Some Americana plums, which were just setting, were injured. While the fore part of the month was cool, the latter part of the month was warm to very warm, the temperature being 80° Fahr. on sixteen out of the eighteen days between the 13th and the end of the month, although the nights were comparatively cool. The highest temperature was 89·4° Fahr. on the 22nd. There was little precipitation in June. Strawberries were suffering badly from lack of moisture on the 25th, and the crop proved almost a failure owing to the drought. Those which ripened had, most of them, hard tips. There was a very heavy drop of apples during the last week in June, doubtless owing to the drought. The closely-planted Wealthy orchard, which is in sod, lost most fruit and a crop that promised to be good became light. The grass of the lawns was much burned during the last week of June and continued burned until August 4.

The month of July was warm and dry. The highest temperature was 92·8° Fahr. on the 9th, and on the 6th it was 92·0° Fahr. It was 80·0° Fahr. and above on twenty-two days of the month. While the days were warm, the nights, on the whole, were comparatively cool. Showers started on the 21st, and, from that time on there were frequent rains throughout the rest of the growing season, though vegetation did not begin to recover much until after a heavy rain on August 4, as the previous showers had been light. The highest temperature in August was 87·2° Fahr. on the 3rd; the nights continued comparatively cool through this month. September was moderately warm with a maximum temperature of 77° Fahr. on the 17th. There was no frost recorded in September, the lowest temperature observed being 35·8° Fahr. on the 22nd. In October, the highest temperature was 73° on the 5th. The first autumn frost was on October 8, when the temperature was 31° Fahr. The foliage of tender plants, such as tomatoes, squash, etc., was injured in some situations. In other places, the foliage was little, if any, injured. On the 13th, the temperature dropped to 25° Fahr., when the tenderer things were killed. The foliage of the grape vines was injured on this date. The growth of fruit trees was late, the wood did not ripen as well as was desirable in the autumn, and it is probable there will be considerable winter injury on this account. November was a cool month with fairly even temperatures, the highest being 57·2° Fahr. on the 1st, and the lowest 17° Fahr. on the 21st.. Winter set in on the 27th with the ground frozen to a depth of three or four inches.

The weather in December, January, February and March was cold, the thaws being of short duration. The first time the temperature rose as high as 40° Fahr. from November 5 was on March 20.

While the temperature did not go to twenty degrees below zero except on December 31, when it was 25·2° Fahr., the coldest day of the winter, it was below zero fifty times during the winter, thirteen in December, eighteen in January, thirteen in Febru-

ary and six in March. In the winter of 1903-4, it was fifty-eight times below zero, and twenty and more below zero fifteen times, so that, although this was a severe winter, it was not so cold as that one.

The last day when the temperature was below zero was on March 24, when it was 0·1° Fahr. below zero. The ground has been covered with snow since December 2, when enough fell for sleighing, but there was only about six inches in depth all through December, and little more than two feet during the winter. There is still sleighing in the country on March 31, with about a foot of snow on the level.

FRUIT AND VEGETABLE CROPS.

The apple crop was less than usual in Canada in 1910. The crop in Nova Scotia, Prince Edward Island, New Brunswick and Quebec was, on the whole, light. In Ontario and some parts of Quebec, the summer and autumn varieties yielded a medium to good crop. In Ontario, the crop of winter apples was light in most places, although in some sections the crop was a medium one. In the prairie provinces, trees which had reached the bearing age had the blossoms or fruit-buds killed by spring frosts. In British Columbia, the crop was good. Pears were a medium to good crop where grown. Plums were light in eastern Canada, but good in British Columbia. Peaches were a medium crop, and grapes medium to good. Small fruits were an average crop in most parts, but in eastern Ontario suffered from drought, making the crop little more than light.

Vegetables were an average crop in most places. At the Central Experimental Farm, there was a medium crop of apples and plums, and few cherries. The small fruit crop was much reduced by drought and could not be called more than light. Grapes were considerably injured by spring frosts and the crop was not more than medium. While a large number of varieties ripened, they were not so sweet as usual. Vegetables, on the whole, were an average crop, though the crop of potatoes was rather light, except from new seed.

MEETINGS ATTENDED, PLACES VISITED AND ADDRESSES GIVEN.

During the past year, the writer has, as usual, attended a number of meetings and given addresses on horticultural subjects. This year, owing to the enlargement of the field of work, more places than usual have been visited.

On April 1, 1910, an address was given before the Hamilton Horticultural Society on 'The Intelligent Care of Garden Plants'; Ottawa Horticultural Society, October 4, 1910, on 'Bulb Culture for the House and Garden.' Two addresses were given before the New Brunswick Fruit Growers' Association on November 1 and 2, one on 'Growing Nursery Stock in Northern Climates,' and one on 'The Care of Bearing Orchards'; the St. John, N.B., Arboricultural Society, November 2, on 'Street Improvement'; Ontario Fruit Growers' Association, November 16, 1910, on 'Standards for Judging Fruits'; Ontario Horticultural Association, November 17, 18, 1910, on 'Novelties,' and a paper on 'The Best Lilies' was prepared for the Nomenclature Committee of that Society. Quebec Pomological Society, December 6, 1910, 'Pear Culture in the Province of Quebec'; the Ramsay Farmers' Club, Almonte, Ont., January 14, 1911, on 'Small Fruit Culture'; the Northumberland and Durham Apple Growers' Association, January 26, 1911, on 'Care of Young Orchards'; and the 'Care of Bearing Orchards.' the Short Course in Horticulture at the Macdonald College, Que., February 1, 1911, on 'Improvement of Plants'; the Niagara Peninsula Fruit Growers' Association, Grimsby and St. Catharines, Ont., March 1, 2, and 3, 1911, 'Results and Conclusions as to Best Varieties of Strawberries and Raspberries for Market.' 'Plums, Pears, and Apples—Best Varieties for the Commercial Orchard'; the Horticultural Club, Macdonald College, March 27, 1911, 'Horticulture at the Dominion Experimental Farms,' and 'Keeping Horticultural Records.' In May,

1910, I visited the Agricultural College, Guelph, Ont., and in June the Arnold Arboretum, Jamaica Plain, Mass., and the Agricultural College, Durham, New Hampshire. On July 20, 1910, I left for the west on a visit to the Experimental Farms and other places among which were Winnipeg, St. Charles, Brandon, and Morden, Man.; Indian Head, Regina, Rosthern, Saskatoon, and Scott, Sask.; Lethbridge, Lacombe, Calgary, Edmonton, Wainwright and Laggan, Alta., Salmon Arm, Kamloops, Agassiz, Vancouver, Victoria, Sidney, Vernon, Summerland, Penticton, and Kelowna, B.C., also the Agricultural College and Experiment Stations at Fargo, N.D., Brookings, S.D., St. Anthony Park, Minn., and Ames, Iowa, at all of which places I learned something which should prove useful in the development of horticulture in Canada.

During October, 1910, I visited the Experimental Farms at Nappan, N.S., and Charlottetown, P.E.I., and also examined the proposed site of the new Station at Kentville, N.S., and in December, I made a further examination to assist in deciding on the area to be selected. On December 30, 1910, I visited the Experimental Station at Cap Rouge, Que.

ACKNOWLEDGMENTS.

I desire again to acknowledge my indebtedness to farmers, fruit growers, and market gardeners throughout Canada and other countries for their kind co-operation in helping to make the work of the Horticultural Division of greater value by furnishing information on various matters, and also by their friendly attitude towards the work we are attempting to do.

It is also a pleasure to be able, through this annual report, to record my appreciation of the faithful and efficient work of those who have assisted me at Ottawa during the past year, those in charge of the various branches of the work and to whom I particularly refer being: Mr. T. Gordon Bunting, Assistant; Mr. J. F. Watson, Secretary; Mr. H. Holz, Foreman; Mr. H. Read, Assistant Foreman; and Mr. Frank Horn, Foreman in the Arboretum and Botanic Garden. To the other men who have done a large part of the physical labour, I wish also to express my thanks for their loyal support.

DONATIONS.

Numerous donations of seeds and plants and other material are received each year by the Horticultural Division from institutions and from persons who are interested in experimental work. This year we have much pleasure in acknowledging the receipt of the following donations:—

Donations during Calendar Year, 1910.

Sender.	Donation
Adney, Tappan, Upper Woodstock, N.B.	Apples, scions of 10 varieties.
Alexander, A., Hamilton, Ont.	Plants Dianthus latifolius atrococcineus, seed of *Papaver umbrosum*.
Allison, J. G., Napanee, Ont.	Seed Yellow Transparent potato.
Botanic Gardens, Durban, Natal, South Africa	Collection of seeds.
Botanic Gardens, Suphur, India	Collection of seeds.
Botanic Gardens, St. Petersburg, Russia	Collection of seeds.
Botanic Gardens, Copenhagen, Denmark	Collection of seeds.
Botanic Gardens, Siena, Italy	Collection of seeds.
Beatty, I. C., Birmingham, Ala.	Plants of Citrus trifoliata (Wild orange).
Beach, Prof. S. A., Ames, Iowa, U.S.	Scions Fall Orange, Delevan Colorado Orange, apples.
Bittorf, Geo., Hopeville, Ont.	Potatoes, Sensation, Early Superior, New King.
Bishop, Mr. Guelph, Ont.	Scions Seedling Bellflower Apple.
Braslan Seed Growers' Co., San José, Cal., U.S.	Seed of Red Wethersfield and Globe Danvers Onions.

Picking and Recording crop of Apples from individual trees, at Central Experimental Farm, Ottawa, Ont., 1910.

Sender.	Donation.
Brill, Fr. Hempstead, N.Y., U.S.	Cabbage Seed, Volga, New Flat and others.
Brown, John, West Lochaber, N.S.	Potatoes Seedling, 2 varieties.
Buchanan Nurseries, St. Charles, Man.	Norway Poplars.
Criddle, N. Treesbank, Man.	Bulbs Lilium andinum.
Crow, Prof. J. W., Guelph, Ont.	Scions Woodhouse Seedling Apple.
Dode, L. A., Paris, France.	Willow cuttings, Maple seed.
Dubuc, Azarias, Richelieu, Que.	Potatoes grown by sender for 35 years, look like Peachblow.
Dunlop, J., Union Hall, Ont.	Scions Dudley, Seedling of Duchess, Early Green Seedling Apples.
Ewing & Co., Montreal.	Seed Duplessis Large Red Wethersfield and Duplessis Danvers Onions.
Flower City Plant Co., Rochester, N.Y., U.S.	Walkers' Excelsior Plant Food.
Fowler, L. U., Bedeque, Que.	Potatoes which took first prize, P.E.I. fair
Frier, Mrs. M. D., Franklin Centre, Que.	Potato seedling.
Fuller, Mr., Aylmer, Que.	Apple scions.
Hainge, H. F., Bangor, Sask.	Potatoes, Up-to-date.
Hall, Rev. Geo., Quorn, Australia.	Seed, Glory Pea.
Hewitt, Mrs. Annie G., Toronto.	Seeds from New South Wales.
Hitchcock, G. R., Massawippi, Que.	Strawberry plants.
Hodges, Mrs. Flora E., Skidegate, B.C.	Potatoes.
Keyes, P. G., Ottawa, Ont.	Scions Apple, Oakland County, Seek-no-further.
Leonard, E. K., Paradise, N.S.	Scions Red Seedling Apple.
Laidlaw, Thos., Rothbury, Sask.	Potatoes, Scotland's Pride.
Lilley, Miss Mary, Dollar, Ont.	Potatoes, Seedling Early Thorburn.
Limlaw, David E., Nutt's Corners, Que.	Seed Illinois Purple Tomato.
Lindsay, Jas., Oxford Mills, Ont.	Potatoes.
Mackinnon, W. A., Birmingham, Eng.	Seed Choux Moellier Cabbage.
Marrison, R. A., Cataraqui, Ont.	Scions Kingston Sugar Plum.
Morse & Co., San Francisco, U.S.	Red Wethersfield and Yellow Globe Danvers Onions.
Murphy, Jas. E., Augustine Cove, P.E.I.	Potato, McIntyre.
McKay, John, Creemore, Ont.	Scions Eureka Seedling Apple.
McIntosh, H. A., Dundela, Ont.	Scions apple thought to be a cross between McIntosh and Salome.
Newman, C. P., Lachine Locks, Que.	25 Plants King Raspberry.
O'Brien, H. T., Noel, N.S.	Potatoes, Prince Albert.
Ogilvie, Wm., North Georgetown, Que.	Cuttings Sweetwater Grape.
Peart, Edwin, Nelson, Ont.	Scions Homestead Apple.
Pieters, A. J., Hollister, Cal., U.S.	Seed Wethersfield, Yellow Globe Danvers Onions.
Queviemont, Geo. W., Torrance, Ont.	Potato Seedling.
Strubler, Phil., Napierville, Ill.	Three Seedling Currant bushes.
Stephens, N. J., Bracebridge, Ont.	Burpee's Extra Early Potatoes.
Taylor, F. S., White's Cove, N.B.	Scions Seedling Apple.
Taylor, Wm. A., Dept. Agriculture, Washington, D.C., U.S.	Scions Buckskin (46555), Martin (46556) Apples.
Todd, W. H., Ingersoll, Ont.	Potato Seedling, Seed of Todd's selected Lettuce.
Weightman & Son, Awahuri, New Zealand, per F. W. Godsal, Cowley, Alta.	Root of seedless Rhubarb.
Wilson, A. E., Clarence, Ont.	Native Plums, 2 jars of preserved. Scions of Native Plums.
Wooton, F. H., Wellman's Corners, Ont.	Scions Crown Apple.

ARBORETUM AND BOTANIC GARDEN.

The Arboretum and Botanic Garden of the Central Experimental Farm, of which the writer has had charge since 1895 and of which he has been curator since 1898, was transferred on January 1, 1911, to Mr. H. T. Güssow, Dominion Botanist. It seems, therefore, a fitting time to review the history of this part of the Central Experimental Farm and the work which has been done in connection with it.

When the Dominion Experimental Farms were organized in 1886, sixty-five acres were selected for the Arboretum and Botanic Garden on the east side of the Farm. The site chosen was a good one, as most of the land is high and a fine view is obtained of the city of Ottawa on the north and east, while to the south there is a pleasing view across country with glimpses of the Rideau River in the distance. The Arboretum is

bounded on the south side by the Rideau canal, which, at this point, has marshy banks that take away the sameness which the canal banks have in many places.

The late Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms, took charge of the Arboretum and Botanic Garden when the first planting was done in the autumn of 1889 and continued in charge until 1895, when the writer, who was then the Director's Assistant and Foreman of Forestry, took up the work. The transfer is recorded in the Report of the Entomologist and Botanist for 1896, where the following statement is published: 'The practical work of the Arboretum and Botanic Garden, which was done to a large measure under my direction until last spring, was then at my request, handed over to Mr. W. T. Macoun, the Foreman of Forestry, who, having men under his control, was in a better position to look after the necessary labour, such as cultivation, planting, tidying up, etc., than I was with only one man, whose time is fully occupied with the grass and fodder experiments. In addition to the above reason, Mr. Macoun is specially well qualified for this work from his natural tastes and knowledge of plants. I had, therefore, very much pleasure in recommending to you that this work should be entrusted to him.'

In 1898, the writer was appointed Curator of the Arboretum and Botanic Garden by Order-in-Council.

In the writer's report for 1895, the following statement is made which shows the number of species and varieties which had been set out up to that time. 'During the spring, 246 species and varieties of trees and shrubs were added to the number recorded last year, making the total of 935 living in the autumn of the present year. The perennial flower border was extended in the autumn from the main entrance to the northern gate, and the greater part of this was planted with 735 additional species and varieties, making a total of 863 now in the Arboretum.' In the autumn of 1910 there were living in the Arboretum and Botanic Garden 3,419 species and varieties of trees and shrubs represented by 4,911 specimens and 2,007 species and varieties of herbaceous perennials. No doubt some of these are synonyms, but the number cannot be very large. This makes one of the most extensive collections of hardy plants in America. It has been brought to its present size by a gradual but regular increase in the collection from year to year, as, by being constantly on the look-out for new things from other institutions, botanic gardens, nurserymen and private individuals, it has been possible to add a considerable number of species and varieties annually.

The original plan was to arrange the trees, shrubs and herbaceous plants in their proper botanical order. This has, to some extent, been adopted, but the large number of species which has been planted has made it practically impossible to keep all plants of one genus in a single group, and in some cases even three separate groups have been made. Furthermore, in many instances, the soil was not suitable where a certain genus would come if kept in the proper sequence, and it was thought better to place the plants in the soil most suited to them, where this could be done.

The trees and shrubs are, in most cases, planted far enough apart to permit of their developing into full-sized specimens without being crowded. The herbaceous perennial border is a prominent feature of the Botanic Garden, and is situated on the east and south-east side of an arbor-vitae hedge. It has a total length of nearly half a mile. The border is twelve feet wide and the plants are in rows three by three feet apart.

Most of the arboretum has been seeded down to lawn grass during the past fifteen years and the grass of a large proportion of the area is kept cut regularly with a pony lawn mower. In order that the trees and shrubs should not be checked in their growth by growing in sod, circles free of sod have been kept cut around them and in this the surface soil is loosened with the hoe during the growing season.

The specimens in the Arborteum and Botanic Garden have been neatly, though not conspicuously, labelled with a zinc label fastened to a stiff wire which is pushed into the ground near the specimen. There is a duplicate zinc label fastened to the tree,

so that, if one is broken off, the other is almost sure to be found. Each label bears a number which corresponds to a number and name in the record book.

While there are, no doubt, some plants which are incorrectly named, the great majority are, we believe, true to name. In most cases, the plant has been labelled with the name under which it was received, awaiting the time when more critical examination was possible.

Every year during the past fifteen years the trees, shrubs and herbaceous plants have been examined and notes taken on each individual specimen. These notes have been mainly horticultural in character and relate to the hardiness, height and growth of the plants. Popular descriptions of many of the flowers of herbaceous plants have been made and published.

In 1899, a 'Catalogue of the Trees and Shrubs in the Arboretum and Botanic Garden' was prepared and published jointly by Dr. Wm. Saunders, Director, and the writer, in which is a list of 3,071 species and varieties, with notes on their relative hardiness. In 1908, there was prepared and published by the writer, as Bulletin No. 5, Second Series, a 'List of Herbaceous Perennials tested in the Arboretum and Botanic Garden' with popular descriptions of the flowers, blooming season and height to which the plants grow.

The collection was also used from time to time as a basis for various lists of plants recommended for ornamental purposes.

In 1910, the work done in the Botanic Garden was much as usual, notes of the hardiness and growth of the plants were taken, labels were written for plants which needed them and the whole herbaceous border was re-labelled with a larger zinc label than had been used before. The total number of species and varieties of trees and shrubs added in 1910 was 100, represented by 154 specimens. There was an average amount of injury from the winter of 1909-10.

SEEDLING FRUITS RECEIVED FOR EXAMINATION, 1910-11.

Each year a number of seedling fruits are sent to the Horticultural Division for examination and for a report as to their merits. In order that a record may be kept, a full or partial description is made of most of those received. In the past, partial descriptions of the poorer ones have been published in the Annual Report and full descriptions of the most promising, but this year descriptions are published of the better ones only. Following is a list of seedlings sent in, with names of the senders and record number. Of these, those received from Mr. Tappan Adney, Upper Woodstock, N.B., are of special interest, being, most or all of them, varieties originated or brought together by the late F. P. Sharp, Woodstock, N.B., who did much in his day for the advancement of horticulture in his province.

501—Wiley from Tappan Adney, Upper Woodstock, N.B. (See full descriptios.)
502—'Mark No. 6', 'Bittersweet', from Tappan Adney, Upper Woodstock, N.B. (See full description.)
503—Peabody Greening, from Tappan Adney, Upper Woodstock, N.B. (See full description.)
504—Munro Sweet (Sharp's), from Tappan Adney, Upper Woodstock, N.B. (See full description.)
505—'Mark No. 19', from Tappan Adney, Upper Woodstock, N.B.
506—'Mark No. 31', from Tappan Adney, Upper Woodstock, N.B.
507—'Mark No. 24', from Tappan Adney, Upper Woodstock, N.B.
508—'Mark No. 21', from Tappan Adney, Upper Woodstock, N.B.
509—'Mark No. 28', from Tappan Adney, Upper Woodstock, N.B.
510—'Mark No. 30', from Tappan Adney, Upper Woodstock, N.B.
511—'Mark No. 29', from Tappan Adney, Upper Woodstock, N.B.
512—'Mark No. 5', from Tappan Adney, Upper Woodstock, N.B.
513—'Mark No. 26', from Tappan Adney, Upper Woodstock, N.B.
514—'Mark No. 20', from Tappan Adney, Upper Woodstock, N.B.
515—'Mark No. 33', from Tappan Adney, Upper Woodstock, N.B.
516—'Mark No. 27', from Tappan Adney, Upper Woodstock, N.B.
517—'Raymond Red', Crab, from Tappan Adney, Upper Woodstock, N.B.

518—Seedling Apple, from George W. White, Woodstock, N.B., sent by Tappan Adney, Upper Woodstock, N.B.
519—'Woodstock Blossom', grown by Mr. Harrison, sent by Tappan Adney, Upper Woodstock, N.B.
520—'Mark No. 34', from Tappan Adney, Upper Woodstock, N.B.
521—'Mark No. 18,' Seedling, from Tappan Adney, Upper Woodstock, N.B.
522—Seedling Apple, from Mr. Wylie, St. Andrew's, N.B. (See full description.)
523—Sport of Pewaukee, from G. D. Morse, Nictaux, N.S.
524—Apple or Crab Apple, from C. L. Stephens, Orillia, Ont.
525—Apple, from C. L. Stephens, Orillia, Ont.
526—Seedling, from W. J. Kerr, Woodroffe, Ont. (See full description.)
527—Apple, No. 1, from C. B. St. George, Tramore, Ont.
528—Apple No. 2, from C. B. St. George, Tramore, Ont.
529—Apple, No. 3, from C. B. St. George, Tramore, Ont.
530—Apple, Norfolk Beauty (Strawberry King), from J. E. Johnson, Simcoe, Ont. (See full description.)
531—Apple from Geo. Bowman, Spring Valley, Ont.
532—Apple, from F. S. MacLeod, Hintonburgh, Ont.
533—Seedling Apple, from W. Judge, Orangeville, Ont. (See full description.)
534—Seedling Apple No. 1, from T. C. Paddon, Toronto, Ont.
535—Seedling Apple No. 2, from T. C. Paddon, Toronto, Ont.
536—Seedling Apple No. 3, from T. C. Paddon, Toronto, Ont.
537—Seedling Crab, from M. G. Hagerman, Toronto, Ont.
538—Seedling Apple, from Geo. L. Moore, Belleville, Ont.
539—Seedling Apple, from Alex. McNeill, Ottawa, Ont.
540—'Mark No. 13', from Tappan Adney, Upper Woodstock, N.B.
541—Apple, from A. D. Verreault, Villages des Aulnaies, Que.
542—Apple, from W. R. Taylor, Aylmer, Que. (See full description.)
543—Apple, from Mrs. Dennis Darcy, Sheenboro, Que. (See full description.)
544—Plum Seedling, from J. Kilpatrick, 276 Turner St., Ottawa, Ont.

501. Wiley.—Above medium size, roundish; ribbed; cavity open; medium depth; stem short, stout; basin open, medium depth, wrinkled; calyx closed; colour, greenish-yellow, almost covered with attractive crimson; predominant colour, attractive crimson; dots few, pale, indistinct; skin moderately thick, tender; flesh white with traces of red, tender, juicy; core medium; subacid, little flavour; above medium quality; season evidently September.

Tree originated with James Wiley, Jacksontown, Carleton Co., N.B. Thought to be a seedling of New Brunswicker. Top grafts were fruiting with F. P. Sharp, Woodstock, N.B., in 1890.

An attractive-looking apple, but not as good as Langford Beauty, and no handsomer. May be useful. Specimens from Tappan Adney, Upper Woodstock, N.B.

502. 'Mark No. 6,' 'Bittersweet.'—From Tappan Adney, Upper Woodstock, N.B.—Medium size; oblate to roundish, flattened at ends; cavity open, medium depth; stem short, moderately stout; basin open, deep, wrinkled; calyx open; colour, pale yellow, streaked and splashed on sunny side with carmine; dots obscure; skin moderately thick, tender; flesh, yellow and white, sometimes with traces of red, crisp, tender, juicy; core medium; subacid, pleasant flavour; quality good to very good; season evidently late September and October.

A good dessert apple, but not quite attractive enough and shows bruises too easily for market. Said by Tappan Adney to be one of Mr. Sharp's earliest crosses between New Brunswicker and St. Lawrence.

503. Peabody Greening.—Medium size; roundish, flattened at ends, ribbed; cavity medium depth and width, russeted at base; stem short, moderately stout; basin deep, open, wrinkled; calyx open; colour, greenish-yellow with traces of red on sunny side; predominant colour greenish-yellow; seeds above medium, acute; dots obscure; skin moderately thick, tender; flesh yellowish, crisp, tender, juicy; core medium, open; pleasant flavour; good quality; season evidently December to February, or later.

Thought to have originated in Carleton Co., N.B., with the Peabody family. Resembles Grimes' Golden a little in outward appearance and character of flesh. May

be desirable for home use in New Brunswick and cold districts. Specimens received from Tappan Adney, Upper Brunswick, N.B.

504. Munro Sweet (Sharp's).—Medium size; roundish conical; cavity open, medium depth; stem short, stout; basin narrow, medium depth, slightly wrinkled; calyx open; colour, pale yellow, well washed with bright crimson; predominant colour bright crimson; dots moderately numerous, yellow, distinct; skin thick, tough; flesh white, tender, moderately juicy; core medium; sweet, pleasant flavour; above medium to good quality; season evidently early to mid-winter.

Said to be a cross made by F. P. Sharp, Woodstock, N.B., between New Brunswicker and an unknown variety about 1869, at which time seed was planted in orchard of David Munro. The first fruit was in 1879. A handsome apple. Specimens received from Tappan Adney, Upper Woodstock, N.B.

522. Seedling Apple from Mr. Wylie, St. Andrews, N.B.—Medium to below in size; roundish conical; cavity narrow, shallow, russeted; stem short, stout; basin very shallow, open, wrinkled; calyx closed or partly open; colour, yellow well washed with orange-red and crimson; predominant colour orange-red; seeds medium size, acuminate; dots moderately numerous, conspicuous; skin thick, moderately tough; flesh white, tinged with red about basin, crisp, firm, tender, juicy; core medium; subacid, pleasant flavour; good quality; season evidently late September and October.

An attractive looking apple and promising, if hardier than Wealthy.

The tree was found wild on the property of Mr. Wylie, near St. Andrews, N.B. Specimens received from R. C. Treherne, St. Andrews, N.B.

526. Seedling apple from W. J. Kerr, Woodroffe, Ont.—Medium size; oblate, perhaps to roundish; cavity deep, medium width, russeted; stem short, stout; basin deep, medium width; calyx open; colour yellow, washed and splashed with carmine; predominant colour carmine; seeds medium size, broad, acute; dots few, yellow, indistinct; skin moderately thick, tough; flesh dull white, tender, juicy; core medium; subacid, little flavour; above medium quality; beginning of season said to be same as Duchess, but said to keep much longer.

530. Norfolk Beauty (Strawberry King).—Large; roundish, ribbed; cavity open, shallow to medium, russeted; stem short, stout; basin medium to deep, medium width, wrinkled; calyx closed or partly open, colour yellow, well washed and splashed with deep orange-red to dark red; predominant colour deep orange-red to dark red; seeds few, above medium, acute, several abortive; dots moderately numerous, yellow, distinct; skin thick, moderately tough; flesh yellow, crisp, tender, moderately juicy; core medium size, partly open; subacid, high, aromatic flavour; very good quality; season evidently November to February. Originated with Mr. John Winter, Port Ryerse, Norfolk county, Ont. Mr. James E. Johnson, Simcoe, Ont., from whom specimens were obtained, writes that it was bought for Strawberry King.

Darker in colour than Tompkins' King and flesh not quite so coarse, but a little juicier. Flavour much the same as King. On the whole this seems to be a better apple.

533. Seedling apple from W. Judge, Orangeville, Ont.—Medium size; roundish, slightly angular; cavity open, medium width, stem medium length, stout; basin open, shallow, wrinkled; calyx open; colour pale yellow splashed and washed with bright red; predominant colour bright red; seeds medium, dots obscure; skin thin, tender; flesh dull white, tender; core small; subacid, pleasant flavour; good quality; season early September. Promising.

542. Apple from W. R. Taylor, Aylmer, Que.—Large; roundish conical; cavity deep, medium width, russeted near base; stem medium length, slender; basin deep,

medium width; calyx closed; colour yellow washed and splashed with attractive crimson; dots moderately numerous, yellow, distinct; skin moderately thick, tough; flesh dull white or yellowish with traces of red, tender, juicy; core below medium; subacid, pleasant flavour; good quality; season October, probably to January.

Much like Wealthy in outward appearance, flesh and flavour, but is more pointed at apex and skin shows whiter at apex than Wealthy. It is also a better keeper.

543. Apple from Mrs. Dennis Darcy, Sheenboro, Que.—Large; oblate, ribbed; cavity deep, open; stem short, stout; basin deep, open, wrinkled; calyx partly open; colour pale yellow, washed and splashed with carmine; predominant colour carmine; dots few, white, distinct; skin moderately thick, tender, moderately juicy, coarse; core medium size; briskly subacid, pleasant flavour; above medium quality; season evidently mid-September to early October.

A large, handsome apple, said to be a seedling of Duchess and hardier than Wealthy. Too coarse for dessert. May be a good cooker.

APPLE TREES ORIGINATED IN THE HORTICULTURAL DIVISION, CENTRAL EXPERIMENTAL FARM.

In 1910 there were 144 seedling varieties of apples originated in the Horticultural Division which fruited for the first time, making a total of 720 which have fruited from seed sown in 1898 and later.

Of the varieties which fruited, 171 have been sufficiently promising to warrant propagating for further test. Descriptions of 48 varieties originated in the Horticultural Division have been published in previous annual reports, and the following 13 are published for the first time this year.

Bingo (Northern Spy Seedling).—Fruit, above medium to large; roundish conical; cavity deep, narrow, russeted; stem short, stout; basin narrow, deep, slightly wrinkled; calyx partly open; colour, pale greenish-yellow, washed and splashed with crimson with darker splashes; predominant colour, crimson; seeds medium size, broad, acute; dots few, white, distinct; skin thick, tough; flesh yellowish with traces of red, tender, moderately juicy; core small; flavour subacid, sprightly, pleasant; quality good; season December to late winter.

Resembles Northern Spy considerably in outward appearance, flesh, and flavour. Not quite juicy enough. Promising.

Carno (McIntosh Seedling).—Medium size; oblate, regular; cavity medium depth and width; stem short, stout; basin deep, narrow, nearly smooth; calyx partly open; colour, pale yellow well washed with attractive crimson; predominant colour, crimson; seeds medium, acute; dots few, grey, indistinct; bloom bluish; skin moderately thick, tough; flesh yellowish, crisp, juicy; core small, subacid, pleasant sprightly; quality good to very good; season evidently November to January.

Resembles McIntosh in colour and Shiawassee in shape. Flavour a little like McIntosh and has an aroma like that apple. An attractive looking apple. Seems a better keeper than McIntosh.

Cora (Langford Beauty Seedling).—Above medium size; roundish, very slightly angular; cavity medium depth and width; stem short, stout; basin medium depth and width, slightly wrinkled, almost smooth; calyx closed or partly open; colour, pale yellow, almost white with a pink blush on sunny side; dots white surrounded with pink, moderately numerous, prominent; skin thin, tender; flesh white, tender, breaking, juicy; core medium; subacid, good, Fameuse-like flavour; quality good to very good; season late September to October.

Much like Princess Louise, but earlier. Flesh and flavour markedly Fameuse-like. Does not resemble Langford in outward appearance. Would be quite desirable if more attractive in appearance.

Glenton (Northern Spy Seedling).—Size above medium to large; roundish to oblate conic; cavity deep, open, russeted at base; stem medium length, stout; basin deep, medium width, wrinkled; calyx closed; colour, yellow well washed, almost covered with crimson; predominant colour crimson; seeds medium, acute; dots small, moderately numerous, pale yellow, distinct; skin moderately thick, moderately tender; flesh yellowish with traces of red, tender, moderately juicy; core medium; subacid, pleasant flavour; quality good; season evidently October to late November. Resembles Northern Spy a little in outward appearance, character, flesh and flavour.

Kildare (Langford Beauty Seedling).—Medium size; oblate to roundish conic; cavity medium depth and width; stem medium to long, slender; basin narrow, medium depth, nearly smooth; calyx partly open; colour, pale yellow, washed and splashed with crimson; predominant colour crimson; dots moderately numerous, white, distinct; skin moderately thick, tough; flesh white with traces of yellow, crisp, tender, juicy; core medium; subacid, sprightly, pleasant flavour; quality, good; season late September probably to December.

Resembles Langford Beauty a little in outward appearance and in character of flesh, and considerably in flavour. An attractive-looking apple of the season of Wealthy, but better in quality. Flesh is somewhat like McIntosh, and flavour a little also.

Kim (Langford Beauty Seedling).—Medium size; roundish, regular; cavity narrow, medium depth, russeted; stem short, slender; basin deep, open, nearly smooth; calyx open; colour, yellow, washed and splashed with crimson; predominant colour crimson; seeds medium size, acute; dots few, white, distinct; bloom pinkish; skin moderately thick, tender; flesh white with traces of red, crisp, juicy; core medium; subacid, sprightly, pleasant flavour; quality good; season December to late winter, probably.

Resembles Langford Beauty a little in outward appearance. Quite promising.

Luke (Wealthy seedling).—Above medium to large; oblate to roundish conic; cavity narrow, medium depth, russeted; stem short, moderately stout; basin open, medium depth, almost smooth; calyx open or partly open; colour pale greenish yellow washed with deep red, mostly on sunny side; dots obscure; skin thick, moderately tough; flesh dull white or yellowish, rather coarse, tender, moderately juicy; core small; subacid, pleasant flavour; quality good; season October and November, probably to mid or late December.

Resembles Wealthy considerably in outward appearance, character of flesh and flavour. A better keeper than Wealthy.

Niobe (Northern Spy Seedling).—Above medium size; roundish, regular, conical; cavity deep, medium width; stem medium to long, slender; basin deep, medium width, smooth; calyx partly open; colour greenish-yellow washed and splashed with rather dull crimson; predominant colour, rather dull crimson; seeds above medium; dots few, white, indistinct; bloom thin, pinkish; skin moderately thick, tough; flesh yellowish, crisp, tender, rather coarse, moderately juicy; core medium; mildly subacid, pleasant flavour. Quality good; season December to late winter.

Resembles Northern Spy a little in outward appearance and considerably in flavour.

Ripon (Langford Beauty Seedling).—Medium size; roundish; cavity narrow, medium depth, russeted; stem medium length, slender; basin medium depth and width, smooth; calyx closed; colour yellow well washed with crimson; dots moderately numerous, grey, distinct; skin moderately thick, moderately tough; flesh white, tinged with red, showing green about core, tender, juicy; core medium; subacid, sprightly, pleasant flavour, slightly astringent; quality good, season November, probably to January.

Resembles Langford Beauty considerably in outward appearance and character of flesh and slightly in flavour. Distinctly of Famueuse group.

Rocket (Northern Spy Seedling).—Above medium size; roundish, conical; cavity deep, medium width, stem short, stout; basin deep, narrow, slightly wrinkled; calyx partly open; colour yellow, washed and splashed with crimson; predominant colour, crimson; seeds, medium size, acute; dots moderately numerous, yellow, distinct; bloom pinkish; skin moderately thick, moderately tough; flesh yellowish, crisp, tender, juicy; core medium; subacid, pleasant, sprightly flavour; quality good; season November, probably to January or later.

Appearance, flesh, flavour and odour much like Northern Spy.

Roger (Gano Seedling).—Medium size; roundish, very slightly ribbed; cavity open, medium depth, stem long, slender; basin open, deep, slightly wrinkled, calyx open, colour yellow, washed with attractive crimson; predominant colour, attractive crimson; seeds large, obtuse; dots few, white, indistinct; bloom thin, pinkish; skin moderately thick, moderately tender; flesh yellowish, rather coarse, firm, moderately juicy; core small; subacid, pleasant flavour; quality above medium to good; season late November to late winter.

Resembles Gano very much in outward appearance. Flesh is also somewhat similar, and seeds very large like Gano. An attractive looking apple.

Rosalie (Northern Spy Seedling).—Above medium size; roundish, ribbed; cavity deep, open, russeted; stem medium length, moderately stout; basin deep, medium width, wrinkled; calyx closed; yellow, thinly splashed and washed with carmine; predominant colour, carmine; seeds above medium size, acuminate; dots obscure; skin moderately thick, tender; flesh white, crisp, tender, juicy; core medium size, open; subacid, sprightly, pleasant flavour; quality good; season late November, probably through most of the winter.

Somewhat like Northern Spy in character of flesh and flavour, but not in outward appearance. If a little higher in colour would be very promising.

Seton (McIntosh Seedling).—Medium size; roundish to oblate; cavity open, shallow to medium; stem short, stout; basin open, medium depth, smooth; calyx open; colour pale green, washed with dull pinkish-red, mostly on sunny side; seeds medium size, acute; dots obscure; skin moderately thick, moderately tough; flesh dull white, crisp, tender, juicy, core small; subacid, pleasant flavour; quality good; season late December, probably late winter.

Does not resemble McIntosh, except about cavity. Tastes somewhat like Rhode Island.

CHARACTERISTICS OF APPLE SEEDLINGS ORIGINATED IN THE HORTICULTURAL DIVISION

Descriptions are taken of the seedling apples which are originated in the Horticultural Division, whether they are good, medium or poor. By doing this, it is possible to tell after a time what parent varieties are giving the largest proportion of promising varieties, and what the least. It gives valuable information for future work in breeding apples, as showing what characteristics of the female parent are apparent or conspicuous in the seedlings.

In the following table, certain characteristics of 581 seedlings of eleven varieties are given in such a form that they can be readily compared. These seedlings were raised from seed saved from apples which fruited in 1898. The flowers were not hand-pollenized and the male parents can only be suggested by the characteristics of the seedlings and the varieties which grew nearest to the tree from which the seed was taken. Of these we have a record. While the male parent is thus not known with certainty, a study of the following table will be found very interesting and, it is hoped, suggestive. The following characteristics of the seedlings of the eleven varieties are quite marked.

Fameuse Seedlings.—It is generally supposed that seedlings of Fameuse resemble the female parent in a marked degree. In this case the number of good Fameuse seedlings has been small, while a large proportion of the seedlings of McIntosh, which is a seedling of Fameuse, have been good.

Gano Seedlings.—A large proportion of the seedlings resemble the female parent in regularity of form, in colour, in absence of flavour, and in having large seeds. A large proportion of the seedlings are winter apples like female parent.

American Golden Russet Seedlings.—It is interesting to note that of 19 seedlings which have fruited none have russet skins. Nearly ninety-five per cent are green or yellow apples. A comparatively small proportion has been propagated and none has been thought good enough to name.

Langford Beauty Seedlings.—A large proportion are handsome, fine-grained apples of the Fameuse type with a marked resemblance to the female parent or to Louise, a seedling of Fameuse.

Lawver Seedlings.—While twenty-five per cent of the seedlings are late-keeping apples like the female parent, it is interesting to note that a large proportion have a season before December. Some of the Lawver seedlings show marked signs of Northern Spy blood, particularly in character of flesh and flavour. Both Lawver and Northern Spy are late-blooming sorts and were not very far apart in the orchard in 1898.

McIntosh Seedlings.—The McIntosh is supposed to be a seedling of Fameuse and has many Fameuse characteristics. Its seedlings have been much better than the Fameuse seedlings, over one-half the McIntosh seedlings being thought worthy of propagation, while less than a fourth of the Fameuse seedlings were propagated.

Northern Spy Seedlings.—Though self-sterile, and thus doubtless pollenized by some other variety or varieties, there has been a marked resemblance to the Northern Spy in a large proportion of the seedlings in outward appearance, flesh, and flavour, and in being late-keeping apples.

Salome Seedlings.—The Salome has given some good seedlings, though the best are not from this variety. A large proportion of the seedlings bore a marked resemblance to Salome in outward appearance, flesh and flavour.

Shiawassee Seedlings.—The Shiawassee is a seedling of Fameuse. A large proportion of its seedlings had fine grained, tender flesh and were above medium to good in quality, but the percentage thought worth propagating was about the same as the Fameuse seedlings.

Swazie Seedlings.—Only a small proportion of the seedlings resemble the parent in outward appearance, though a large percentage bear a marked resemblance to Swazie in flavour. The Swazie is a small apple, but of the seedlings, over 78 per cent were medium to large.

Wealthy.—There is a general resemblance to Wealthy in a large proportion of the seedlings, particularly in colour and the regular outline of the fruit and character of flesh and flavour.

In describing the apples of which the characteristics are given in the following table, the standards adopted for size were as follows:—

Small—2¼ inches in diameter, and below.
Below medium—2¼ to 2½ inches in diameter.
Medium—2½ to 2¾ inches in diameter.
Above medium—2¾ to 3 inches in diameter.
Large—3 to 3½ inches in diameter.
Very large—Above 3½ inches in diameter.

Characteristics of the Fruit of Seedling Apples at the Central Experimental Farm.

—	Character of Parent.	Fameuse Seedlings.	Character of Parent.	Gano Seedlings.	Character of Parent.	American Golden Russet Seedlings.	Character of Parent.	Langford Beauty Seedlings.	Character of Parent.	Lawver Seedlings.	Character of Parent.	McIntosh Seedlings.	Character of Parent.	Northern Spy Seedlings.	Character of Parent.	Salome Seedlings.	Character of Parent.	Shiawassee Seedlings.	Character of Parent.	Swazie Seedlings.	Character of Parent.	Wealthy Seedlings.
Number Seedlings Fruited		33		49		19		54		44		44		27		52		56		84		119
Number Seedlings Propagated		7		8		3		23		8		24		10		13		12		27		36
Number Seedlings Named		1		1		0		6		3		5		7		4		1		5		12
Size—		%		%		%		%		%		%		%		%		%		%		%
Small		9·10		8·16		0·00		1·85		9·09		2·27		3·70		5·76		3·57	x	4·76		7·56
Below medium		36·36		10·20		10·52		9·26		6·81		11·36		11·11		19·23		14·28		16·67		14·29
Medium	x	36·36		46·94	x	52·63		53·70	x	63·64		54·55		40·75		40·39	x	44·64		46·43		42·02
Above medium		18·18	x	32·66		31·58	x	35·19		20·46	x	25·00		33·33	x	19·23		28·58		20·24	x	29·41
Large		0·00		2·04		5·27		0·00		0·00		6·82	x	11·11		15·39		8·93		11 90		6·72
Total		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00
Form—																						
Oblate		21·21		10·20		26·31		33·33		29·54		34·09		25·93		13·47	x	62·50	x	42·86		36·13
Roundish	x	75·76	x	65·31	x	68·42	x	66·67	x	56·82	x	54·55	x	70·37	x	61·53		35·72		42·86	x	58·83
Conical		0·00		18·37		0·00		0·00		4·55		9·09	x	3·70		11·53		1·78		8·33		2·52
Oblong		3·03		6·12		5·27		0·00		9·09		2·27		0·00		13·47		0·00		5·95		2·52
Total		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00
Colour—																						
Green or yellow		0·00		4·08		94·73		11·11		9·09		2·27		0·00		1·92		25·00		21·43		0·00
Crimson or red	x	66·67	x	83·68		5·27	x	85·19	x	68·18	x	84·09	x	81·48		57·69	x	60·72		28·57	x	78·15
Pink or pinkish red		21·21		2·04		0·00		3·70		4·55		9·09		3·70		11·53		7·14		9·52		2·52
Orange or orange red		12·12		10·20		0·00		0·00		18·18		4·55		14·82	x	28·86		7·14		25·00		19·33
Russet		0·00		0·00	x	0·00		0·00		0·00		0·00		0·00		0·00		0·00	x	14·29		0·00
Total		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		100·00		98·81a		100·00

Flavour—											
Sweet	6·06	10·20	0·00	3·70	20·45	13·63	7·40	9·62	1·78	10·71	13·44
Mildly subacid	12·12	x 18·37	15·79	11·82	15·90	2·27	3·70	7·69	1·78	x 4·76	1·68
Subacid	x 51·52	46·94	x 73·69	x 51·85	45·45	x 72·74	x 55·56	x 42·31	x 53·57	53·58	34·46
Briskly subacid	21·21	24·49	10·52	25·93	x 9·09	9·09	33·34	34·62	32·15	25·00	x 39·50
Acid	6·06	0·00	0·00	3·70	4·54	2·27	0·00	5·76	7·14	5·95	10·92
Total	96·97*a*	100·00	100·00	100·00	95·43*b*	100·00	100·00	100·00	96·42*b*	100·00	100·00
Quality—											
Poor	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
Below medium	0·00	2·04	0·00	0·00	0·00	0·00	0·00	0·00	3·57	0·00	2·52
Medium	27·27	69·39	52·63	9·26	47·72	9·09	14·81	42·31	14·28	23·81	26·89
Above medium	48·49	x 28·57	42·10	42·59	36·37	38·63	55·56	42·31	44·64	44·05	52·94
Good to very good	x 24·24	0·00	x 5·27	x 48·15	x 15·91	x 52·28	x 29·63	x 15·38	x 33·93	x 30·95	x 15·80
Total	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	96·42*b*	98·81*a*	99·15*a*
Season—											
August-mid-September	15·15	0·00	0·00	x 16·67	11·36	6·82	3·70	11·53	19·64	7·14	21·00
Mid-September, October	15·15	10·20	10·52	27·76	12·73	18·18	18·52	30·77	32·15	13·09	29·41
October-November	x 48·49	14·28	42·11	22·23	22·73	x 38·64	29·63	15·39	23·21	41·67	x 27·73
December-February	12·12	24·49	5·26	24·08	9·09	18·18	x 29·63	x 17·30	x 8·93	x 10·72	12·60
December-April	9·09	x 42·86	x 42·11	7·41	x 25·00	18·18	18·52	17·30	10·72	27·38	7·56
Total	100·00	91·83*d*	100·00	98·15*a*	90·91*d*	100·00	100·00	92·29*d*	94·65*c*	100·00	98·30*b*
Resemblance—											
In outward appearance	27·27	26·53	....	38·89	15·90	27·27	55·55	36·52	14·28	10·72	47·90
In flesh	39·39	53·06	21·05	50·00	25·00	45·45	59·25	88·46	58·94	25·00	40·34
In flavour	33·33	40·80	36·84	22·22	....	34·09	51·85	51·90	33·93	35·23	20·17
No resemblance	30·30	20·40	36·84	1·85	54·54	27·27	22·22	3·81	26·79	32·85	25·21
In whiteness of flesh only	9·09	....	....	....	....	....	....	....	....	....	....
In form and not colour	....	22·44	....	....	....	....	....	....	....	....	....
In colour and not form	....	14·28	....	....	....	....	....	....	....	....	....
In large seeds	....	55·09	....	....	47·70	....	....	....	....	....	....
In form only	....	....	26·31	29·62	4·54	....	....	5·76	....	17·64	....
In colour	....	....	....	....	....	31·81	....	....	....	14·29	....
In colour only	....	....	....	11·11	4·54	....	....	19·23	....	....	....

Legend—*a* This character not recorded for 1 seedling. *b* This character not recorded for 2 seedlings. *c* This character not recorded for 3 seedlings. *d* This character not recorded for 4 seedlings.

YIELDS OF APPLE TREES FROM THIRD TO TWENTY-SECOND YEAR AFTER PLANTING.

There are many persons who desire to grow apple trees who would like to know when the trees will begin to bear and how much fruit they may expect to obtain at a certain time after planting. Up to the present, so far as the writer knows, no figures have been published in America giving the yields of individual trees from the time they begin to bear. At the Central Experimental Farm, the yields of individual trees have been kept since 1898, and the records from some of the trees were published under the head of 'Individuality of Fruits' in the annual reports for 1903, 1905, the Interim Report for 1905-6, 1909, and again this year, in another part of this report. These records, were, however, to show the variation in yield of trees of one variety rather than a comparison of the yields of different varieties. In some cases in this table, the yields from the time the trees began to bear are not published, as the trees were too long planted before the records began to be kept. If it had been possible, it would have been desirable to give the average yields of a large number of trees of each variety in this table, but the orchards at the Central Experimental Farm were planned for variety testing rather than from the commercial standpoint, hence there are but few trees of each variety grown. On account of the small number of trees of each variety under test, it has been thought best to publish the yields of the best-yielding tree of each variety, also, where it was possible, the yield of a young and of an older tree, and also the records of some trees which are annual bearers. In this table, it will be noticed that the Wealthy tree of which a record is given, began to bear four years after planting. The Wealthy, in many cases, bears three years after planting, if three-year old trees are set. It may be stated that, in most cases, the trees of which the yields are published were three years old when planted. The trees are grown in cultivated orchards where cover crops are used, and, although not all under such similar conditions, that an entirely accurate comparison of the yields of different varieties can be made, it is thought that the yields thus published will prove valuable to intending planters.

Yield of Fruit in Gallons, per tree, Yearly, from Date of Planting.

Record Number.	Variety.	Date of Planting	3rd year.	4th year.	5th year.	6th year.	7th year.	8th year.	9th year.	10th year.	11th year.	12th year.	13th year.	14th year.	15th year.	16th year.	17th year.	18th year.	19th year.	20th year.	21st year.	22nd year.	Total yield 1898-1910.	Number of years planted in orchard.
1	Yellow Transparent	1890	...	...	...	...	...	*27	1	17¾	0	59	1	97	25	109	10½	100	0	91	...	...	*538¼	20
2	"	1897	...	...	3	6	14	26	5	46½	0	42	0	...	...	...	...	...	...	...	...	...	142⅓	13
3	Duchess of Oldenburgh	1888	...	...	...	...	...	...	...	*46	22½	66	6	82	16	100	54	143	0	126	1	131	*793⅓	22
4	" "	1888	...	...	...	...	...	...	...	*32	¼	42½	1	63½	47	89	70	111½	68	100	52½	111½	*778¾	22
5	" "	1897	½	1	2½	18½	9	44	0	79½	0	78	0	...	...	...	...	...	...	...	...	...	234	13
6	Wealthy	1888	...	...	...	...	...	...	...	*33	0	52	2	93	0	111	22	96½	1½	75	5	118	*609	22
7	"	1896	...	5	3¾	12½	½	32	28½	21	51	32	52	42	...	...	...	...	...	...	...	...	279¼	14
8	Fameuse	1888	...	...	...	...	...	...	...	* ½	35	23¼	11¾	97	34	42	73	¼	39	72	13½	77	*518	22
9	"	1897	...	...	1	16½	0	20	0	10	20	25	38	...	...	...	...	...	...	...	...	...	130½	13
10	McIntosh	1890	...	...	...	...	...	*17½	26	37	6½	71½	94	12	109	3	109	41½	184	50	...	...	*761	20
11	"	1893	...	...	...	4½	0	19	2½	19	16½	64	28	...	...	...	...	...	...	...	...	...	163½	13
12	Milwaukee	1895	3	6	10	5	19	25	12	50	1	56	43½	62	1	...	...	...	...	...	...	...	293½	15
13	Baxter	1889	...	...	...	...	...	...	*8	2¼	0	0	14	28½	18	55	55½	62	36	50	20	...	*349¼	21
14	Lowland Raspberry	1888	...	...	...	...	...	...	...	*14½	0	½	1¼	15½	30	18	65½	7½	74½	14	91	13½	*345¾	22
15	"	1892	...	...	...	...	...	...	...	* ¼	0	1	8½	1	9	29	11½	46½	...	...	...	...	*106¾	18
16	Langford Beauty	1897	...	...	...	1½	1½	24	3	0	17	25	61	...	...	...	...	...	...	...	...	...	133	13
17	McMahan	1888	...	...	...	...	...	...	...	*62	0	83	2	147	1½	141	40	124	11	142	2½	133	*889	22
18	"	1888	...	...	...	...	...	...	...	*25	4½	46	½	69½	43	72	96	75	52	81	78	97	*739½	22
19	Peach of Montreal	1888	...	...	...	...	...	...	...	* 1½	27¼	32	36¾	71	47	61	82	58	54	38	55	27	*590½	22
20	Canada Baldwin	1888	...	...	...	...	...	...	...	* 8	4½	10½	2½	29	30	17	70	17	54	11	46	27	*326½	22
21	Antonovka	1888	...	...	...	...	...	...	...	* 3	0	9½	2	57	7	88	68	105	84½	84	77	112	*697	22
22	"	1888	...	...	...	...	...	...	...	* 0	2½	12½	10	47	22	67	40	69	15	110	33	87	*515	22
23	"	1888	...	...	...	...	...	...	...	* 2½	0	14	9	15	44	12½	70	0	73	2	109	0	*351	22
24	"	1897	...	...	2½	2½	18	18	33	41	55	9½	50	...	...	...	...	...	...	...	...	...	229½	13
25	Hibernal	1888	...	...	...	...	...	...	...	*19	0	74	0	60½	0	98	18	121	22	134	3	120	*669½	22
26	"	1892	...	...	...	...	...	2	4½	4	24	7	60	0	122	⅓	61	0	...	...	...	...	285	18
27	Charlamoff	1888	...	...	...	...	...	...	...	*20	4½	32	6½	66	6	106¼	33	81	33	103	38	97½	*626¾	22
28	"	1897	...	...	7	12½	15	40	0	88	0	73	0	...	...	...	...	...	...	...	...	...	235½	13
29	Dudley	1891	...	...	...	...	*12	4	2	6	39	39	88	68	64	48	25	27	73	...	...	...	*495	19
30	Patten	1892	...	...	...	*27	2	35	1½	71	15	84	34	92	3	138	0	95	...	...	...	...	*597½	18
31	Bethel	1890	...	...	...	...	...	½	0	0	1½	17½	8½	1	30	3	78	0	55	20½	...	...	215½	20
32	"	1895	...	...	...	...	...	¼	½	11	0	22	34	18	44	...	...	...	...	...	...	...	129¾	15
33	Anis	1888	...	...	...	...	...	...	...	8½	0	13½	8½	76	12½	86	70	83	62	119	35½	142	*716½	22
34	"	1890	...	...	...	...	...	*13	0	5	3¼	62½	10½	69	74	65	60½	92	49	135	...	...	*638¾	20
35	"	1890	...	...	...	...	...	* 1	0	6	1½	67½	16½	80	106	8	146	0	155	½	...	...	*588	20
36	Anisim	1888	...	...	...	...	...	...	...	* 0	¾	5½	4	42	37	16	88	8	110	1½	130	52	*494¾	22

* Record previous to 1898 not kept.

INDIVIDUALITY OF APPLE TREES, AS SHOWN IN THE ORCHARDS AT THE CENTRAL EXPERIMENTAL FARM.

At the Central Experimental Farm, the yield of each individual bearing tree of apples and plums has been kept since the year 1898. The yields for these thirteen seasons have given a most valuable record of the variation in yields of trees of the same variety planted at the same time and under about the same soil and cultural conditions Of some varieties there have been but a few trees available for comparison, but the yields even from these are very suggestive.

In the following table are published the yields of only a few of the varieties from which the returns have been kept. The records of many other varieties could be given in the same way.

APPLES, WEALTHY—Planted 1896—Yield in Gallons.

Tree.	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Total Yield 1899-1910
1	1·0	2·25	2·75	15·0	·0	17·0	1·0	15·0	·0	17·0	0·5	12·0	83·5
2	2·0	·5	2·5	12·0	·0	14·0	8·0	2·75	Dead.	......	......	......	41·75
3	1·75	12·0	2·25	8·0	·0	6·5	7·0	Dead.	......	......	......	......	37·5
4	9·0	2·25	15·5	20·5	27·0	1·0	28·0	1·5	25·0	24·5	37·0	12·0	203·25
5	7·5	6·5	7·75	23·0	7·5	23·0	13·0	14·0	0·	14·5	4·5	10·5	131·75
6	3·25	6·5	3·5	24·0	0·	17 5	5·0	11·5	0·	9·5	·5	2 0	83·25
7	7·5	1·0	10·0	19·0	16·0	0·	19·0	0·	1·5	6·5	17·5	2·0	100·00
8	0·	8·5	·5	21·5	0·	10·0	5·0	3·5	3·5	6·0	5·5	3·0	57·0
9	0·	11·25	·25	27·5	0·	21·0	20·0	2·25	5·0	8·5	8·5	0·	104·25
10	1·0	12·25	0·	30·0	0·	17·5	8·0	1·75	10·0	4·75	21·5	2·5	109·25
11	1·25	11·25	0·	21·5	0·	31·0	10·0	18·5	0·	11·5	22·0	13·0	140·0
12	0·	7·5	0·	18·5	0·	13·5	13·5	2·5	R'ved	......	......	......	57·5
13	4·25	6·25	4·5	20·0	2·0	20·5	19·0	1·25	3·0	4·75	6·5	4·5	96·5
14	2·5	5·5	0·5	34·0	0·5	17·0	8·0	14·0	0·5	13·0	3·0	9·0	107·5
15	0·	2·25	3·5	21·5	0·0	31·5	16·0	25·0	0·	13·5	16·0	14·5	143·75
16	3·0	2·25	4·0	22·5	8·5	16·5	23·5	1·75	14·0	12·5	13·0	4·0	125·5
17	0·	2·0	1·0	22·5	4·5	8·5	16·0	0·	7·5	1·5	23·0	7·25	93·75
	44·0	100·0	58·5	361·0	66·0	266·0	220·0	115·25	70·0	148·0	179·0	96·25	1716·0

APPLES, MCMAHAN—Planted 1888—Yield in Gallons.

Tree.	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Total Yield 1898-1910
1	62·0	0·	83·0	2·0	147·0	1·5	141·0	40·0	124·0	11·0	142·0	2·5	133·0	889·0
2	42·0	1·0	6·0	12·5	93·0	23·0	116·0	30·0	114 0	17·0	120·0	11·0	93·0	783·5
3	32·0	29·0	49·0	18·0	55·0	63·5	56·0	108·0	9·0	84·0	12·0	121·5	2·0	639·0
4	35·0	0·	34·5	4·0	63·0	34·0	67·0	69·0	49·0	31·0	73·0	22·0	72·0	554·5
5	0·	37·5	55·0	49·0	0·	61·0	0·	98·0	0·	54·0	0·	100·0	24·0	478·5
6	25·0	4·5	46·0	0·5	69·5	43·0	72·0	96·0	75·0	52·0	81·0	78·0	97·0	739·5
7	0·5	9·5	19·5	4.0	19·0	39·5	14·0	37·0	0·	20·0	0·	63·0	0·	226·0
8	7·0	9·0	27·0	9·0	53·0	15·5	54·0	35·5	64·0	21·0	96·0	32·5	102·0	525·5

APPLES, MCINTOSH—Planted 1890—Yield in Gallons.

Tree.	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Total Yield 1898-1910
1...	17·5	26·0	37·0	6·5	71·5	94·0	12·0	109·0	3·0	109·0	41·5	184·0	50·0	761·
2...	1·0	9·5	10·5	1·0	37·5	31·0	6·0	72·0	6·0	23·0	33·0	110·0	27·0	367·5

APPLES, PATTEN—Planted 1892—Yield in Gallons.

Tree.	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	Total Yield 1898-1910
1...	27·0	2·0	35·0	1·5	71·0	15·0	84·0	34·0	92·0	3·0	138·0	0·	95·0	597·5
2...	2·0	6·0	14·0	19·0	24·0	55·5	7·5	66·0	0·	82·0	0·	88·0	1·0	365·0
3...	2·0	31·0	1·5	40·5	22·0	67·0	26·0	69·0	0·5	71·0	6·0	70·0	0·	445·5
4...	13·0	0.	6·5	0·	12·0	15·0	45·0	45·0	13·0	48·0	12·0	52·0	30·0	291·5
5...	1·0	0·	19·0	0·5	17·5	21·0	54·0	75·0	0·5	74·0	0·	68·0	0·5	331·0

PLUMS.

There was a medium to light crop of plums in 1910. There was promise of a good crop until June 4, when a frost, just as the fruit was setting, caused a large proportion of the crop to drop. New varieties of plums are being tested every year in the effort to obtain hardier and more useful ones. Seedlings from early ripening varieties of the native plum *Prunus nigra* are being raised in the effort to obtain better early plums. Early native plums bring good prices in some parts of Canada and are the only ones which can be grown successfully in other sections. The tree of the native plum does not break down as readily from snow as *Prunus Americana*, which is a great advantage. The skin of the fruit of the latter is also much thicker, as a rule, than *Prunus nigra*.

One of the most promising seedling plums that fruited this year of those originated at Ottawa is a seedling of the Caro, which is a seedling of the Wolf; a description of this follows:

DARA (Caro seedling).—Roundish to oval; large; cavity open, medium depth; suture a distinct line, very slightly depressed; apex rounded; colour, yellow, mottled and thinly washed with red; dots obscure; skin thick, moderately tender; flesh yellow, juicy; stone medium size, oval, almost free; sweet, pleasant flavour, skin acid; good quality. A good late plum.

CHERRIES.

There were practically no cherries in 1910. While there would have been a fair crop owing to the comparatively mild winter of 1909-10, when less fruit buds than usual were killed, the frost of June 4 destroyed what promise there was. The Downy-

leaved Cherry (*Prunus tomentosa*), a bush cherry described in the annual report for 1908, had a medium crop of fruit. This is hardier than the tree cherries and promises to be a very useful fruit for the colder parts of Canada. The writer saw this cherry growing at Brandon, Man., in 1910, and the seedlings under the parent bush showed that the bush had fruited there.

GRAPES.

The grape vines came through the winter well in 1910, as they usually do, and there was promise of a good crop until June 4, when the frost lessened it very much On the whole, however, there was a medium crop. Vines in this vicinity suffered more, in some cases, than those at the Experimental Farm, the crop being entirely destroyed. Where grapes have to be covered with soil in winter, as they have at Ottawa, it is important to leave them covered in the spring as late as possible without breaking off the young shoots, as spring frosts are more to be feared than winter injury. The autumn being one without killing frosts until October 13, it made a long ripening season, but, on account of the cool nights, the grapes did not ripen as quickly as they generally do and, although 97 varieties ripened, they were not of as good flavour as usual.

SMALL FRUITS.

The crops of currants and of gooseberries were medium ones in 1910, but raspberries and strawberries were light, owing to the drought in June and July and there were few blackberries, as usual. The Ruby raspberry continued to be a promising red sort. The Count and Brighton, two early red varieties originated by Dr. Wm. Saunders, are very productive. The King is proving one of the hardiest varieties in the prairie provinces. Herbert is still the best red raspberry at Ottawa, but growers who ship berries long distances find that it is not firm enough for them. No new varieties of strawberries under test were of special promise in 1910. The Paul Jones was one of the best. The following description was made of it in 1910.

Paul Jones (Imperfect).—Fruit conical; above medium size; calyx medium; external colour bright scarlet, glossy; flesh bright scarlet; seeds moderately prominent; core tender; juicy; pleasant, acid; above medium quality; season medium early; moderately firm; plant vigorous; many runners; foliage good; very little rust.

Appears productive. Is attractive in appearance.

Obtained from R. W. Johnson, Northboro, Mass., in 1909, and said to be a cross between Haverland and Brandywine.

VEGETABLES.

For the past twenty-three years, experiments with vegetables have been an important part of the work of the Horticultural Division. During that time, hundreds of varieties have been tested and many cultural experiments conducted, some of which are reported upon each year. As it is important to have early varieties of vegetables in many parts of Canada, extra early strains of some of the more important sorts are being developed by selection in order to show, if possible, how each farmer could raise and improve his own seed. Good results have already been obtained with beans, tomatoes and corn.

FARMERS' LIST OF BEST VEGETABLES.

The Faramers' List of Best Vegetables, which has been published from time to time in the annual report, has been much appreciated. This list is really a summary

of the variety tests and gives, in a comparatively small space, the names of those vegetables which are considered the best. The following list has been revised up to the autumn of 1910:—

Asparagus.—Palmetto is proving a better variety than Conover's Colossal for general planting, as it is not so subject to the disease known as Asparagus Rust. Argenteuil is also a good variety.

Beans.—Round Pod Kidney Wax and Wardwell's Kidney Wax are two of the best yellow-podded or wax bush beans, and are both early. Stringless Green Pod, Early Red Valentine and Early Refugee are three good, green-podded varieties. Refugee or Thousand to One is one of the best later sorts. Among Lima beans, the dwarf or bush forms are the most satisfactory.

Beets.—Metoer, Early Model, Electric, Egyptian and Eclipse are some of the best.

Borecole or Kale.—Dwarf Green Curled Scotch.

Brocoli.—White Cape.

Brussels Sprouts.—Improved Dwarf. The dwarf varieties have been found more satisfactory than the tall-growing ones.

Cabbage.—Early Jersey Wakefield (early), Succession (medium), Danish Ballhead and Drumhead Savoy (late), Red Dutch (red) is a good list. Houser has been found freer from disease than most. For extra early use, Paris Market is desirable, being nearly a week earlier than Early Jersey Wakefield.

Cauliflower.—Early Dwarf Erfurt and Early Snowball.

Carrots.—Chantenay is one of the best, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching (Paris Golden Yellow) (early), French Success, Noll's Magnificent, Perfection Heartwell, Triumph, Winter Queen are all good late varieties. London Red is a good red one.

Corn.—Malakoff, Peep O' Day (extra early), Early Fordhook, Early Cory (early), Crosby's Early, Golden Bantam, Metropolitan (second early), Perry's Hybrid, Early Evergreen and Black Mexican (medium) Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably and is of fine quality. Golden Bantam is the best second early for home use. It is of excellent quality.

Cucumbers.—Peerless White Spine or White Spine, Davis Perfect, Cool and Crisp, and Giant Pera are some of the most satisfactory. Boston Pickling and Chicago Pickling are good pickling sorts.

Egg Plant.—New York Improved and Long Double Purple succeed best.

Lettuce.—Black-seeded Simpson (early curled), Iceberg, New York, Giant Crystal Head, Crisp as Ice, and Improved Hansen (curled cabbage), Improved Salamander (uncurled cabbage). Grand Rapids is the best variety for forcing. Iceberg remains headed longest in summer. Trianon and Paris are two of the best Cos varieties.

Melons, Musk.—Long Island Beauty and Hackensack are two of the earliest and best of the Nutmeg type. Montreal Market is later, but of larger size and finer flavour. Emerald Gem and Paul Rose are two of the best yellow-fleshed melons.

Melons, Water.—Cole's Early, Salzer's Earliest, Ice Cream, Phinney's Early are some of the most reliable.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best and most reliable. Australian Brown is also good. Prize Taker is a good variety for transplanting.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Chili, Cardinal. The Early Neapolitan is one of the earliest of the large peppers.

Peas.—Gregory's Surprise (extra early), Thos. Laxton, Gradus, American Wonder, Nott's Excelsior, Sutton's Early Giant (early), Sutton's Excelsior, Premium Gem (second early), McLean's Advancer, Heroine and Stratagem (medium to late). The foregoing varieties, not being tall growers, may be grown without supports. Telephone and Champion of England are two of the best tall-growing sorts

Potatoes.—Early: Rochester Rose, Early Ohio (pink), Irish Cobbler, Eureka Extra Early, Early Petoskey, New Early Standard (white), Bovee (pink and white), Main crop: Carman No. 1, Gold Coin, Factor, Dalmeny Beauty, Money Maker (white).

Radishes.—Early: Scarlet White-tipped Turnip, Rosy Gem, French Breakfast, Red Rocket (red), Icicle (white), Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured, New White Chinese or Celestial.

Rhubarb.—Linnaeus, Victoria.

Salsify.—Long White, Sandwich Islands.

Spinach.—Victoria, Thickleaved.

Squash.—White Bush Scalloped, Summer Crook Neck. Late: Delicious, Hubbard.

Tomatoes.—Early: Sparks' Earliana, Chalk's Early Jewel, Bonny Best, Dominion Day (scarlet). Medium: Matchless, Trophy (scarlet), Livingston's Globe, Plentiful (purplish pink).

Turnips—Early: Extra Early Milan, Red Top Strap Leaf.

Swedes.—Champion Purple Top, Skirving's Improved.

POTATOES.

Experiments with potatoes were continued in the Horticultural Division in 1910. Varieties were tested for comparison of yields, relative immunity from blight, improvement of strain, and to test the relative values of seed of the same variety grown in different parts of Canada. Spraying experiments were also conducted during the year.

The season of 1910, was not a good one for potatoes in the Ottawa district. The latter part of June and the month of July, when potatoes should be forming, was very dry and the number and size of tubers was, on this account, very much lessened, especially where seed of low vitality was used. The advantage of seed of strong vitality was very apparent in a season like 1910, as they made a quick, strong growth and the roots were well down before the drought set in.

The potatoes in the uniform test plots where 136 varieties were grown, were planted on May 17, on good, sandy loam soil where a bush fruit plantation had been the previous year. The soil was manured in the autumn of 1909, with well-rotted barnyard manure. The ground was ploughed in the spring and harrowed once with the disc and once with the smoothing harrow, shortly before planting time. The drills were opened thirty inches apart with the double mouldboard plough. Sixty-six sets

of each variety were planted. The sets were cut so that they would have at least three good eyes each, and were dropped one foot apart in the rows, and were covered with the hoe to ensure greater uniformity. The land was harrowed when the potatoes were coming up to destroy weeds and loosen the surface soil to conserve moisture. During the growing season the soil was cultivated eight times. At the last cultivation a little soil was drawn towards the plants and thus almost level cultivation was adopted. The vines were sprayed with Bordeaux mixture six times and a mixture of eight ounces of Paris green and one and one-half lbs. of Arsenate of Lead to a barrel of water was used to kill the potato beetles. The potatoes were dug on October 13 and 14. There was very little rot in the uniform test plots as these were sprayed with Bordeaux mixture. There was much rot in unsprayed plots.

Twelve Most Productive Varieties of Potatoes—Average of Five Years.

Number.	Name of Variety.	Number of years under test	Season.	Colour.	Quality.	Average Yield per Acre, 1906–1910. Bush.	Lbs.
1	Dalmeny Beauty	7	Medium late	White	Good	276	19
2	Carman No. 1	7	"	"	"	245	51
3	Hard to Beat	5	"	"	"	228	22
4	Gold Coin	8	"	"	"	178	38
5	Late Puritan	17	"	"	"	178	12
6	Empire State	23	"	"	"	177	19
7	Ashleaf Kidney	7	"	"	"	172	16
8	Rochester Rose	16	Early	Pink	"	171	10
9	Sharpe's Victor	6	Medium late	White		168	44
10	Dewey	6	"	"	Good	160	36
11	Early Hero	6	Early	Pink	"	153	31
12	Holborn Abundance	22	Late	White	"	153	14

THIRTY MOST PRODUCTIVE VARIETIES OF POTATOES IN UNIFORM PLOTS, 1910.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Un-marketable.		Quality.	Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.		
1	Empire State	448	48	413	36	35	12	Good	White.
2	Ashleaf Kidney	443	18	434	30	8	48	"	"
3	Rochester Rose	429	..	376	12	52	48	"	Pink.
4	Prince Albert	411	24	380	36	30	48	Medium	White.
5	Carman No. 1	402	36	376	12	26	24	Good	"
6	Late Puritan	402	36	347	36	55	..	"	"
7	Dalmeny Beauty	402	36	354	12	48	24	"	"
8	Gold Coin	399	18	331	6	68	12	"	"
9	Reeve's Rose	374	..	301	24	72	36	"	Pink.
10	Queen of Thanet	347	36	310	12	37	24	"	White.
11	Moreton	342	6	291	30	50	36	"	"
12	Factor	334	24	305	48	28	36	"	"
13	Irish Cobbler	332	12	301	24	30	48	"	"
14	President Kruger	332	12	303	36	28	36	Medium	"
15	Money Maker	319	..	288	12	30	48	Good	"
16	White Wonder	319	..	292	36	26	24	"	"
17	Pink Seedling from A.D. Smith, Glendale N.S	312	24	301	24	11	..	....	Pink.
18	Myatt's Ashleaf	310	12	294	48	15	24	Good	White.
19	Chapman	292	36	268	24	24	12	"	"
20	Queen of the Earth	292	36	272	48	19	48	"	"
21	Late Petoskey	288	12	244	12	44	..	....	"
22	Eldorado	282	48	244	12	38	36	....	"
23	Sutton's Superlative	266	12	248	36	17	36	Good	"
24	Seedling from P. Barrett, Truro, N.S.	257	24	226	36	30	48	....	
25	King's Champion	255	12	224	24	30	48	Good	"
26	Blue Seedling from A.D. Smith, Glendale, N.S	248	36	239	48	8	48	....	Bluish.
27	Michigan Rose	246	24	237	36	8	48	Good	White.
28	Cottar	244	12	239	48	4	24	....	"
29	Planet	242	..	226	36	15	24	....	"
30	King of All	237	36	222	12	15	24	....	"

TEN MOST PRODUCTIVE VARIETIES—33 Sets Planted, 1910.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Early Surprise from G. Bittorf, Hopeville, Ont	444	24	413	36	30	48
2	Sensation, from G. Bittorf, Hopeville, Ont	440	..	431	12	8	48
3	Seedling, from W. H. Todd, Ingersoll, Ont	418	..	409	12	8	48
4	King Seedling, from Steele & Briggs Seed Co., Toronto, Ont.	378	24	330	..	48	24
5	McIntyre, from J. C. Murphy, Cape Traverse, P.E.I	369	36	352	..	17	36
6	New King, from G. Bittorf, Hopeville, Ont	365	12	338	48	26	24
7	Burpee's Extra Early, from N. J. Stephen, Bracebridge, Ont.	349	48	334	24	15	24
8	Prince Albert, from H. J. O'Brien, Noel, N.S	316	48	316	48	..	..
9	Epicure, from Chas. Scott, Elphinstone, Man	290	24	220	..	70	24
10	Seedling No. 1, from R. A. McCloskey, Dawson, Yukon	255	12	224	24	30	48

TEN MOST PRODUCTIVE VARIETIES—16 and 8 Sets Planted, 1910.

Number.	Name of Variety.	No. of Sets Planted	Total Yield per Acre.		Yield per Acre Market-able.		Yield per Acre Un-market-able.	
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Flourball, from Johnson Seed Co.	8	501	36	475	12	26	24
2	Seedling from Miss. Mary Lilley, Dollar, Ont.	16	448	48	431	12	17	36
3	Purple potato, from John Brown, West Lockaber, N.S.	8	440	..	422	24	17	36
4	Potato, from John Brown, West Lockaber, N.S.	8	422	24	404	48	17	36
5	Seedling from G. W. Queviemont, Lorraine, Ont.	16	387	12	352	..	35	12
6	Green Mountain, from Jas. Lindsay, Oxford Mills, Ont.	16	387	12	352	..	35	12
7	Vulcan, from Jas. Lindsay, Oxford Mills, Ont.	16	382	48	374	..	8	48
8	Bruce, from Jas. Lindsay, Oxford Mills, Ont.	16	369	36	334	24	35	12
9	Potato, from Miss Flora E. Hodges, Skidegate, B.C.	8	352	..	334	24	17	36
10	Unknown potato, from A. C. Atkinson, Regina, Sask.	16	334	24	237	36	96	48

POTATOES—TWELVE MOST PRODUCTIVE VARIETIES WHEN NOT SPRAYED WITH BORDEAUX MIXTURE, 1908-1910.

Since 1905, those varieties which have proven productive and freest from blight when sprayed with Bordeaux mixture have been grown by themselves and have not been so sprayed. In all, fifty-three varieties have been grown in this way. A large proportion of these have been discontinued as they have not done well when unsprayed. In the following table are the names of twelve tested during the past three years, with yields. These are all medium late or late sorts and it has been noticed for several years that the potatoes freest from late blight are the later varieties. These were planted on May 17, and dug on October 19, 1910.

TWELVE VARIETIES OF POTATOES. NOT SPRAYED WITH BORDEAUX MIXTURE, 1908-1910.

Number.	Name of Variety.	Season.	Number of Years Under Test.	Shape.	Colour.	Depth of Eyes.	Quality.	Yield per Acre Sound Tubers, 1910.		Yield per Acre Diseased Tubers, 1910.		Average Yield per Acre, Three Years 1908-1910.	
								Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	King Edward	Late	5	Roundish to oval, flattened	White	Shallow	Good	195	48	4	24	245	40
2	Dalmeny Beauty	Medium late	7	Oval to roundish, flattened	"	"	"	182	36	6	36	213	48
3	Factor	"	5	" "	"	"	"	147	24	6	36	203	8
4	Hard to Beat	"	5	" "	"	"	"	96	48	..	..	202	24
5	Highlander	"	4	" "	"	"	"	129	48	6	36	188	31
6	Duchess of Cornwall	"	5	" "	"	"	"	75	54	4	24	177	50
7	White Giant	"	4	Oblong	"	Medium	"	147	24	..	..	154	44
8	Dr. Maerker	Late	12	Roundish	"	Medium to deep	Medium	92	24	13	12	154	0
9	Sirdar	Medium late	4	Roundish, flattened	"	Shallow	Good	41	48	68	12	106	20
10	Holborn Abundance	Late	22	Roundish	"	Medium to deep	Medium	107	48	4	24	101	56
11	Carman No. 1	Medium late	16	Oblong to roundish	"	Shallow to medium	Good	83	36	46	12	93	52
12	State of Maine	"	21	" "	"	Medium to shallow	"	55	0	35	12	74	4

SPRAYING POTATOES WITH BORDEAUX MIXTURE FOR THE PREVENTION OF LATE BLIGHT AND ROT.

Experiments with Bordeaux mixture for the prevention of late blight and rot were begun at the Central Experimental Farm in 1892, and from time to time since the results have been published. The value of spraying has been so well proven by the experiments conducted here and in many other parts of this and other countries that, if it were not for the large number of persons who every year grow potatoes for the first time, it would not be necessary to demonstrate the value of spraying. In 1910, rot was very bad where potatoes were not sprayed, and the following experiment shows most strikingly the value of spraying. In one plot, the potatoes were sprayed with an insecticide only, namely, Paris green in the proportion of eight ounces to forty gallons of water. Another plot was sprayed with Bordeaux mixture and Paris green on June 27, July 9, July 26 and August 11. At the last spraying, no insecticide was used. Another plot was sprayed with Soda Bordeaux (Burgundy mixture) and Paris green on the same dates, and a fourth plot with Paris green only until August 2, when Bordeaux was used for the first time. A second application of Bordeaux was given on August 11. Each plot in this experiment was one-forty-fourth of an acre in extent. The potatoes were planted on May 17, and dug on October 15.

	Yield per acre. Bush.	Lbs.
Not sprayed with Bordeaux mixture..	117	20
Sprayed with Bordeaux mixture	234	40
Not sprayed wtih Bordeaux mixture until August 2 ..	200	12
Sprayed with Soda Bordeaux (Burgundy mixture).. ..	190	18

This experiment shows that, in years like that of 1910, it will pay well to spray even as late as August 2, but it is advised to begin spraying with Bordeaux mixture not later than July 15, and it is wiser to begin even with the first spraying for the Colorado Potato beetle, in order to protect the plants from the flea beetles, as the edges of the holes in the leaves made by these insects are places from which the Late Blight spreads, and it has been found that Bordeaux mixture prevents much injury from them.

POTATOES—CHANGE OF SEED.

The results obtained from growing potatoes from Nappan, Nova Scotia, for comparison with seed potatoes grown at Ottawa, which were published in the annual reports for 1909 and 1910, were so striking that, in 1910, seed was obtained from the Experimental Farm, Indian Head, Sask., with the remarkable results given in the table. The illustration in this report shows the great difference, in the size of the tops of the potato plants, between the Ottawa seed and the Indian Head seed. The vines from the latter seed made a quick, vigorous growth and, when the drought came in the latter part of June and through July, the roots were well down and thus able to withstand it better than those which had made slower and weaker growth. Seed potatoes from parts of the country or possibly even from particular soils where the plants grow comparatively late, have more vitality or vigour than those which have been grown where the growing season is shortened by hot weather and severe droughts which cause a drying-up of the tops and check the development of the tubers. The potatoes in this test were planted on May 17, 1910 and dug on October 13.

INDIAN HEAD, SASK., SEED VERSUS OTTAWA, ONT. SEED IN 1910.

Number.	Name of Variety.	Indian Head Seed. — Yield per Acre.		Ottawa Seed. — Yield per Acre.		Difference in favour Indian Head Seed.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Empire State	448	48	107	48	341	..
2	Ashleaf Kidney	443	18	41	48	401	30
3	Dalmeny Beauty	402	36	160	36	242	..
4	Late Puritan	402	36	39	36	363	..
5	Gold Coin	399	18	119	54	279	24
6	Reeve's Rose	374	..	118	48	255	12
7	Rochester Rose	363	..	136	24	226	36
8	Irish Cobbler	332	12	127	36	204	36
9	Money Maker	319	..	70	24	248	36
10	Carman No. 1	289	18	94	36	194	42
11	Morgan Seedling	279	24	46	12	233	12
	Average	368	30	96	42	271	48

TOMATOES—SELECTION TO DEVELOP SUPERIOR EARLY STRAINS.

Wherever possible, the farmer and market gardener should have his own tomato seed, as he should know better than anyone else what kind of tomato he should grow. Experiments are being carried on in the Horticultural Division partly for the purpose of studying the relative values of different methods of selection, and partly to demonstrate, if possible, the advantage of home-grown seed when selected in the best way.

In the year 1901, seed was saved of the earliest ripe fruit of the Sparks' Earliana tomato grown at the Central Experimental Farm. Selection from the earliest single tomato each year of all the tomatoes of this variety grown each year was continued each year until 1904, when several selections were made from the plants of that year. One selection was a single tomato from the plant giving the largest crop of early and most uniform fruit in 1904; another selection from a single tomato from the plant giving the largest crop of early fruit without regard to uniformity; another selection from a single tomato from the plant giving the largest crop of uniform fruit without regard to earliness, and a fourth selection from the first good tomato ripened in these or other plots, regardless of the individual plant from which it came. These selections have been made each year since, the seed being taken from the first good tomato ripened on the individual plant in each of the first three selections which was nearest like the kind of crop sought for by that selection. The fourth selection was made each year from the plant, wherever it might be, which gave the first ripe fruit.

The results presented in the following table show that the results from all of the selections are in the direction in which the selection was made. The largest crop of early fruit selected from individual plants each year is much greater than where the selection was made at random. The tomatoes ripened eight days earlier in the selections for earliness than in the selections for productiveness and uniformity without regard to earliness.

Improvement in uniformity has not yet been marked.

It will be noticed that the yields were much larger in 1910, than in previous years. This is very interesting. The plants were frozen to the ground on June 4, but several strong new shoots came up from the base of the plant, producing apparently the same effect as the pruning experiments recorded in the annual reports for 1904, 1905, and 1906, when plants which were pinched back in order to make laterals develop gave larger crops than those not so treated.

Experiment showing importance of change of seed. Taller plants from Indian Head seed, lower-growing plants of the same varieties from Ottawa seed.

TOMATOES—RESULTS FROM SELECTION

Selected for	No. of plants grown.	Average date of first ripe fruit.	Average yield of early ripe fruit per plant.	Average total yield of ripe fruit per plant.	Average yield of early ripe fruit per acre	Average total yield of ripe fruit per acre.	Uniformity.
1910.			Ripe to Aug. 23.		Ripe to Aug. 23.		
			lbs. oz.	lbs. oz.	lbs.	lbs.	
Most uniform and largest crop of early fruit	55	Aug. 17	0–14	27– 2·5	39·7	1232·2	100·0
Most productive and most uniform....	29	" 26	0– 3	21– 4·25	8·5	970·0	87·3
Largest crop of early fruit................	25	" 18	0–15·5	21–13·	43·9	989·7	85·3
Earliest ripe fruit..........................	20	" 22	0– 7	21–13·5	19·8	991·1	78·6
1909.			Ripe to Aug. 18.		Ripe to Aug. 18.		
Most uniform and largest crop of early fruit	42	Aug. 4	4–11·5	14– 3	214·1	643·7	100·0
Most productive and most uniform........	42	" 11	1– 4	14– 8·5	56·7	659·3	87·6
Largest crop of early fruit	41	" 7	1–12·5	14– 5	80·6	649·4	93 1
Earliest ripe fruit......................	28	" 2	2– 8·5	12– 1·5	114·8	548·7	96·5
1908.			Ripe to Aug. 18.		Ripe to Aug. 18.		
Most uniform and largest crop of early fruit	40	July 27	1– 3	14– 1	53·9	638·1	100·0
Most productive and most uniform.	54	Aug. 15	0– 9·3	18– 2	26·4	822·4	80·3
Largest crop of early fruit................	54	" 5	0–15	12–15·5	42·5	588·4	90·9
Earliest ripe fruit.......	25	" 1	1– 4·5	13– 2·8	58·1	597·8	97·8
1907.			Ripe to Aug. 16.		Ripe to Aug. 16.		
Most uniform and largest crop of early fruit	18	Aug. 13	1– 7·3	13– 4·75	66·0	603·2	100·0
Most productive and most uniform.	21	" 13	1– 6·5	12– 7·5	63·6	565·7	93·6
Largest cropof early fruit.......	24	" 12	1– 9·5	10–10·5	72·1	483·5	99·1
Earliest ripe fruit........................	1	" 6	0–11	4–11	31·2	212·7	81·8
Average for four years, 1907 to 1910.							
Most uniform and largest crop of early fruit	39	Aug. 8	2– 1	17– 3	93·6	779·8	100·0
Most productive and most uniform.. .. .	36	" 16	0–14	16– 9·5	39·7	752·9	87·2
Largest crop of early fruit...............	36	" 11	1– 5	14–15	59·5	677·7	92·1
Earliest ripe fruit.....	18	" 8	1– 4	12–15	56·7	587·0	88 6

SPRAYING EXPERIMENTS.

SPRAYING TO CONTROL OYSTER SHELL SCALE OR BARK LOUSE.

Experiments conducted in the years 1899, 1900, and 1901, by the Horticultural Division for the control of Oyster Shell Scale proved conclusively, in our judgment, that the scales could be removed by the application of lime and water. Several formulas were tried, but the following statement published in the annual report for 1901, gives the conclusions reached and the formulas recommended.

CONCLUSIONS REACHED UP TO DECEMBER, 1901.

1. Lime slacked in water and sprayed on apple trees infested with the oyster shell bark louse has the effect of loosening the scales.

2. The scales, when loosened, are removed from the trees by rain, ice, wind, and probably by other means.

3. As the scales contain the eggs from which the young insects hatch about June 1, it is necessary, in order to get the best results, that the trees be sprayed as soon as

possible after the leaves fall in autumn, so that the loosened scales may be exposed to the weather for a long time before the eggs hatch.

4. The lime appears to have no injurious effect on the eggs within the scales.

5. Lime used in various proportions in the several experiments had no apparent injurous effect on apple or peach trees. Even when the leaf buds were opening, no injury occurred.

6. As the action of the lime seems to occur soon after the trees are sprayed, it is not necessary to use any substance other than water to help bind it to the tree. On the contrary it would appear that such substances counterbalance the effect of the lime, for a time, by glueing the scales to the trees.

7. It is important to use good stone lime, which has not been air-slacked.

8. The most economical and satisfactory formula, so far, has been found to be 1 lb. lime, 1 gallon water, and 3½ ozs. salt, or, for a barrel of mixture, 40 lbs. lime, 40 gallons water, 8 lbs. salt. This should be sprayed on the tree twice, the second application being made as soon as the first is dry. The same proportions of lime and water without the salt have given quite satisfactory results also, and the salt is not necessary, but, when used, the bark of the trees was cleaner and brighter.

9. It is necessary to make at least two applications, as those scales with which the mixture does not come into contact will not be affected by it, hence it is not possible to do the work thoroughly with one spraying.

10. The bark of the trees sprayed with the lime mixture is much brighter afterwards than on trees not sprayed, and it is possible that fungus germs are destroyed.

It will be noticed that it is recommended to spray the trees in autumn in order that the loosened scales may fall from the trees before the eggs are hatched.

As lime-sulphur is now being used quite generally as a fungicide and insecticide when the trees are dormant in early spring, it seemed desirable to learn what effect it would have on the oyster shell scale, and, as the reports from its use elsewhere for this purpose were not always favourable, an additional 20 lbs. of lime was added to each barrel of commercial lime-sulphur, as recommended by Mr. Caesar, O.A.C., Guelph, Ont.

This mixture, which was sprayed on apple trees on April 15 and 22, 1910, gave very satisfactory results, trees which had a large number of scales before the application having but relatively few on January 20, 1911, when notes were taken on the results. On trees sprayed with lime and water on April 20th and 22nd, in the proportion of 1 lb. lime to 1 gallon of water, (two applications on the same day), there was no apparent decrease in the number of scales, which shows the importance of spraying with lime and water in the autumn, if that formula is to be effectual.

LIME-SULPHUR FOR GOOSEBERRY MILDEW.

For the third season, gooseberry bushes were sprayed with lime-sulphur for the control of American Gooseberry Mildew, in 1910. Twenty-two varieties were sprayed, on April 13, when the leaves were beginning to unfold, with lime-sulphur in the proportion of 1 gallon to 9 gallons of water. In most cases five bushes were sprayed and one not sprayed. As in the two previous seasons, the beneficial results from the spraying were not marked. It would seem from our experiments that, if spraying with lime-sulphur is to be effective at all, spraying in spring must be followed up by summer sprays.

EXPERIMENTS WITH INSECTICIDES FOR CONTROLLING THE COLORADO POTATO BEETLE.

The importance of applying poison to potato plants to protect them from the Colorado Potato Beetle is well known to every one who grows potatoes where this insect is troublesome. It is also well known that the larvæ or young beetles eat rapidly, hence a poison must be applied as soon as the larvae appear and this poison must be sufficiently powerful to kill and must be quick-acting. Farmers use Paris green in

much greater strength than is necessary to kill the beetle, but they desire to kill them quickly. Sometimes so much Paris green is used that it injures the leaves. Arsenate of lead, while it does not seem to kill quite as quickly as Paris green, adheres to the foliage much better, hence is especially valuable in showery weather. It has been found that a mixture of Paris green and Arsenate of lead gives good results, as shown in the following table. This gives the quick action of the Paris green with the adhesive qualities of the Arsenate of lead. Two pounds of Arsenate of lead alone to 40 gallons water are shown by this experiment not to be sufficient to kill the beetle promptly; from 2½ to 3 lbs. are necessary. It will be seen that Bordeaux mixture, applied with either Paris green or Arsenate of lead, makes these insecticides more effective. This is, no doubt, partly due to the adhesive properties of the Bordeaux, which cause the insecticides to remain longer on the plants.

Experiments with Insecticides for Controlling Colorado Potato Beetle.

Number of Plot.	Insecticide Used.	1st Spraying. Number of young beetles. June 28, 1910. Before spraying.	Results of 1st Spraying. Number of young beetles. July 4, 1910.	2nd Spraying. Number of young beetles. July 11, 1910. Before spraying.	Results of 2nd Spraying. Number of young beetles. July 13, 1910.
1	Arsenate of Lead (Vanco), 2 lbs. to 40 gallons water	Fairly numerous	Numerous	None	None
2	Arsenate of Lead (Vanco), 2 lbs. to 40 gallons Bordeaux mixture	"	Few	Fairly numerous	"
3	Arsenate of Lead (Grasselli), 2 lbs. to 40 gallons water	"	Very few	Numerous	"
4	Arsenate of Lead (Vreeland), 2 lbs. to 40 gallons water	"	"	Fairly numerous	"
5	Arsenate of Lead (Vanco), 2½ lbs. to 40 gallons water	"	"	"	"
6	Arsenate of Lead (Vanco), 2½ lbs. to 40 gallons Bordeaux mixture	"	"	Few	"
7	Arsenate of Lead (Grasselli), 2½ lbs. to 40 gallons water	"	"	"	"
8	Arsenate of Lead (Vreeland), 2½ lbs. to 40 gallons water	"	"	"	"
9	Arsenate of Lead (Vanco), 3 lbs. to 40 gallons water	"	None	"	"
10	Arsenate of Lead (Grasselli), 3 lbs. to 40 gallons water	"	"	"	"
11	Arsenate of Lead (Vreeland), 3 lbs. to 40 gallons water	"	"	"	"
12	Paris green, 8 ozs. to 40 gallons water	"	Very few	Fairly numerous	"
13	Paris green, 8 ozs. to 40 gallons Bordeaux mixture	"	"	Few	"
14	Paris green, 12 ozs. to 40 gallons water	"	None	"	"
15	Paris green, 16 ozs. to 40 gallons water	"	"	Very few	"
16	Paris green, 8 ozs., Arsenate of Lead 1½ lbs. to 40 gallons water	"	"	Few	"
17	Paris green, 8 ozs., Arsenate of Lead 1 lb. to 40 gallons water	"	"	"	"

NOTE.—Owing to the large number of young beetles alive after the first spraying, Plot 1 was sprayed a second time on July 4th, but no spray was necessary when the other plots were sprayed a second time on July 11.

FOREST BELTS.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries, the belt on the western boundary being 165 feet wide, and that on the northern boundary 65 feet wide. Their total length is nearly 1¾ miles. One of the principal objects for which the forest belts were planted was to obtain information relating to the growth of the best timber trees when grown on different soils at different distances apart, in blocks of single species, and in mixed plantations, the distances chosen at first being 5 x 5 feet, 5 x 10 feet, and 10 x 10 feet apart.

The first planting was done in 1887. As the soil varied considerably in character, it has been possible to note that which seems most suited to the different species. The trees which were planted 5 x 5 feet apart, in blocks of single species, are, in most cases, making the best trees from a timber standpoint, as more of the side branches are killed in the early history of the tree. They were for a time taller, in most instances, than those 10 x 10 feet apart, but the latter are catching up and in some cases are now taller than those 5 x 5 feet apart, and are considerably greater in diameter. The trees 5 x 5 feet apart protect themselves better and there is a less proportion of broken tops at that distance. There is a further advantage in planting the trees fairly closely in that, during their first years, in order to get thrifty growth the soil should be shaded. A better distance than 5 x 5 feet would, we believe, be 4 x 4 feet. In mixed plantations, it is difficult to so arrange the trees that one kind will not overshadow the other and kill too large a number of them. In nature, the proper proportion of fast and slow-growing, shade-enduring and light-needing trees is gradually adjusted as the trees develop. Hence in artificial planting it is desirable to use very few kinds if more than one kind is used. Three quick-growing trees which shade the ground rapidly, will not destroy other kinds for a long time, and are all useful for timber, are the White Pine, Scotch Pine and Norway Spruce. The Canoe Birch, European White Birch, American Elm, and European Larch make a large amount of wood during the first twenty years and are among the most useful for fuel at this stage. They shoot up rapidly and, getting a fair supply of light, make a good trunk development. Being thin-foliaged, these trees do not quickly destroy other kinds that have not grown so rapidly, and can be removed before they do serious harm. Individual specimens of Black Locust which have done well have probably made as much wood as birch or elm, but they are so subject to borers and sucker badly and are so troublesome to get through, that, from our experience, we should not recommend them for a farmer's plantation. These quick-growing trees may be mixed with the Spruce and Pine which, because of their better ability to endure shade, will kill the side branches of the deciduous trees. Other trees, such as Hard Maple and Red Oak, which mature later, should be included in the plantation. Some White Ash should also be grown. This is a fast grower and its wood serves a very useful purpose on the farm. A few trees of White Oak and Black Walnut are desirable as these are valuable when large trees. If the trees mentioned are judiciously mixed, the farmer may have a supply of fuel and wood for timber and other purposes with little labour in the production of it. In planting, we should, from our experience, plant those which are to remain a long time, such as pines, hard maple, oak and walnut at least ten feet apart, with the others between them.

At the Central Experimental Farm, the measurements are taken of the height and diameter of some of the trees every year, the same trees being used annually in nearly every case, and the following table shows the measurements for the past four years. In most cases, the average of three trees is given, in some case, of six trees, and, in a few of less.

GROWTH OF TREES IN THE FOREST BELTS AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA.

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height. 1907.		1908.		1909.		1910.		Average Diameter 4 ft. 6 in. from ground. 1910.
				Year.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Inches.
Black Walnut, Juglans nigra.	Low sandy loam..	1888	5 x 5	1 "	14	1	14	2	14	4a	14	5a	2·375
" " "	" "	1888	10 x 10	1 "	10	5	10	7	10	8	11	0	3·19
" " "	Sandy loam, small stones..........	1889	5 x 5	2 "	21	1	21	4	21	6	21	9	3·66
" " "	" "	1889	10 x 10	2 "	15	7	15	8	15	9	15	10	3·42
" " "	Clay loam........	1888	10 x 5	1 "	21	8	21	11	22	6	23	6	3·725
Butternut, Juglans cinerea, (b)	Low sandy loam..	1889	5 x 5	1 "	11	4	11	4	11	4	11	4	2·125
" " "	" "	1888	10 x 10	1 "	11	5	11	5	11	5	11	5	2·125
Silver-leaved Maple, Acer saccharinum (b)............	Light sandy loam	1889	5 x 5	3 "	32	9	33	0	33	0	33	0	3·37
" " "	" "	1889	10 x 10	3 "	26	3	26	4	All dead.				4·25c
Canoe Birch, Betula papyrifera....................	" "	1889	5 x 5	3 "	36	3	36	6	37	7	38	6	4·37
" " "	" "	1889	10 x 10	3 "	39	1	39	6	40	2	40	10	6·12
Yellow Birch, Betula lutea...	" "	1889	5 x 5	3 "	26	7	27	6	28	7	29	9	3·25
" " ..	" "	1889	10 x 10	3 "	29	3	30	6	31	7	32	9	5·00
White Elm, Ulmus americana	Sandy loam......	1889	5 x 5	3 "	21	6	21	6	22	1	22	4	2·71
" "	"	1889	10 x 10	3 "	25	3	25	9	27	6	28	7	5·21
Black Ash, Fraxinus sambucifolia....	Black muck......	1889	5 x 5	2 "	25	0	27	1	28	4	30	2	2·83
Green Ash, Fraxinus viridis..	"	1889	5 x 5	3 "	30	2	31	2	32	2	33	2	3·87
" " "	Low sandy loam..	1889	10 x 10	3 "	24	5	24	9	25	6	26	3	4·33
Red Ash, " pubescens	Black muck......	1889	5 x 5	2 "	33	5	34	4	36	4	37	6	4·08
" " "	Light sandy loam	1889	10 x 10	2 "	26	3	27	3	28	3	29	10	4·08
White Ash, " americana	Black muck......	1889	5 x 5	3 "	30	6	31	1	31	10	32	10	2·92
" " "	Light sandy loam	1889	10 x 10	3 "	31	8	32	5	33	1	33	9	4·33
Black Cherry, Prunus serotina	Light sandy loam and gravel.....	1889	5 x 5	3 "	26	0	26	3	26	4	26	8	3·21
" " "	" "	1889	10 x 10	3 "	36	3	37	4	38	9	39	5	5·5
Scotch Pine, Pinus sylvestris.	Sandy loam with gravel........	1888	5 x 5	18 in.	31	0	32	0	32	11	34	3	4·46
" " "	" "	1888	10 x 10	18 in.	27	10	28	11	29	1	29	7	5·83
" " "	Low sandy loam and gravel.....	1888	5 x 5	18 in.	29	11	30	4	31	4	32	2	3·66
" " "	Low sandy loam..	1888	10 x 10	18 in.	29	0	29	10	30	6	31	4	6·04
" " "	Light sandy loam	1888	10 x 5	18 in.	33	7	34	10	36	10	38	6	9·17
" " "	Clay loam........	1888	10 x 5	18 in.	27	6	28	4	29	2	30	0	6·83
" " "	Light sandy loam, gravel.........	1888	10 x 5	18 in.	30	0	32	0	33	8	35	3	7·67
" " "	" "	1887	3 x 3	9 in.	33	7	34	10	36	10	38	6	9·17
Austrian Pine, Pinus austriaca	Light sandy loam	1889	5 x 5	18 in.	25	1	29	4	30	8	32	0	5·37
" " "	" "	1889	10 x 10	18 in.	27	0	28	5	29	3	30	8	7·54
" " "	" "	1888	10 x 5	15 in.	26	6	28	1	29	9	31	2	6·96
" " "	Clay loam........	1888	10 x 5	15 in.	27	3	28	4	29	3	30	7	6·53
" " "	Light sandy loam, gravel.........	1888	10 x 5	15 in	29	1	29	7	30	10	32	5	7·21
" " "	" "	1887	3 x 3	15 in.	27	5	28	7	29	10	31	2	3·87
White Spruce, Picea alba....	Light sandy loam	1889	5 x 5	15 in.	17	7	17	11	18	7	19	1	3·12
" " "	" "	1889	10 x 10	15 in.	20	3	21	0	22	0	22	10	4·81
" " "	" "	1889	5 x 5	3 ft.	23	11	24	7	25	5	26	2	5·125
" " "	" "	1889	10 x 10	3 ft.	23	1	24	0	25	0	25	11	6·00
Norway Spruce, Picea excelsa	Light sandy loam	1889	5 x 5	18 in.	25	0	26	7	28	3	30	7	3·87
" " "	" "	1889	10 x 10	18 in.	28	8	30	2	31	10	34	1	5·96
" " "	" "	1888	10 x 5	15 in.	34	10	36	7	37	2	37	10	6·75
" " "	Clay loam........	1888	10 x 5	15 in.	36	8	38	0	38	11	40	3	7·75
American Arbor-vitæ, Thuya occidentalis................	Low sandy loam and black muck	1889	5 x 5	18 in.	21	2	21	11	22	9	23	3	3·79
" " "	Low sandy loam..	1889	10 x 10	18 in.	19	10	20	7	21	9	22	6	3 96

GROWTH OF TREES IN THE FOREST BELTS AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA.—*Concluded*

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height. 1907.		1908.		1909.		1910.		Average Diameter 4 ft. 6 in. from ground. 1910.
					Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Inches.
European Larch, Larix europæa	Low sandy loam	1888	5 x 5	2 ft.	34	1	34	8	35	7	36	4	4·33
" " "	" "	1888	10 x 10	2 ft.	33	4	33	10	35	1*a*	35	9*a*	5·38
White Pine, Pinus strobus	Light sandy loam and gravel	1889	5 x 5	8-10 in	32	11	33	5	34	0	34	9	4·87
" " "	" "	1889	10 x 10	8-10 in	31	1	31	9	33	1	34	4	7·54

a.—Average of two trees. *b.*—For one tree only. *c.*—Average diameter for 1908.

NOTE.—The low, wet, cold, sandy soil in which the Black Walnut and Butternut are growing appears quite unsuitable for these trees and the growth of them is very poor. A light sandy soil in which some of the White Spruce are is not very suitable for that tree, nor is the cold sandy loam where the American Elm is growing. These trees are all making more growth in other soils.

REPORT OF THE DOMINION CEREALIST.

CHARLES E. SAUNDERS, B.A., PH.D.

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the eighth Annual Report of the Cereal Division.

The past season was, on the whole, unusually favourable for cereals throughout the greater part of Canada. Good progress was therefore made at most of the Branch Farms and Stations in the testing of varieties and in the propagation of such sorts as were required for seed purposes. At Ottawa, the dry weather in the early summer seriously reduced the crop on some kinds of soil; but, where the ground was naturally retentive of moisture, good yields were obtained.

The milling and baking tests of standard and of new varieties of wheat have been carried on as usual during the winter months, but on a somewhat larger scale than before. Many interesting new wheats of very high baking strength have been tested for the first time. The investigations into the effect of storage on wheat and flour have also been continued.

The transfer to the Cereal Division of the work connected with the annual distribution of samples of seed grain has very greatly increased the correspondence, which now claims a considerable part of my time.

The duties of the head of the Division have also been extended to include the inspection of all the work done with cereals at the Branch Experimental Farms and Stations. In this connection, visits were paid to Nappan, N.S., and Charlottetown, P.E.I., about the middle of August, but it was not found practicable to visit the western Farms and Stations this year.

Mr. H. Sirett, B.S.A., whose appointment as Assistant was made last summer, has rendered valuable service in the various kinds of field and office work which come within the scope of this Division.

Mr. Geo. J. Fixter, the foreman of the field work and of the distribution of seed grain, has discharged his duties in a very careful and painstaking manner.

My thanks are due, not only to my principal assistants, but also to all the members of the permanent staff of the Division, whose loyalty and interest in the work I greatly appreciate.

In the following pages, there are presented some of the most important results of the work carried on between April 1, 1910, and March 31, 1911.

I have the honour to be, sir,
Your obedient servant,
CHARLES E. SAUNDERS,
Dominion Cerealist.

MEETINGS ATTENDED.

The most important meetings attended during the year were those held in Washington, D.C., in November, when a new society, known as 'The American Society of Milling and Banking Technology' was organized. The need of some standardization of the methods employed in making milling and baking tests of wheat and flour and in the processes of chemical analysis and mechanical examination to which wheat and flour may be subjected is very great, and the objects of the new society are to devise and promulgate satisfactory methods of investigation and analysis. Hitherto each investigator has worked more or less independently, so that his results have been of comparatively little use to other workers. It is believed that, by the employment of standard methods of proved efficiency, not only will the accuracy of all such research work be increased, but the labours of every investigator will be of service to the others.

The first work undertaken by the new society was to send out six samples of wheat, grown in different parts of the United States and Canada, to each member willing to make tests of them. The results of these comparative tests will be used as a basis for the determination of the value of the various methods of procedure and of the unavoidable experimental errors involved in the work. This set of samples is being analysed and tested at this Farm by the Chemist and Cerealist.

VISITS TO BRANCH EXPERIMENTAL FARMS AND STATIONS.

In the month of August, as soon as the harvest at Ottawa was sufficiently far advanced to allow me to leave, I visited the Branch Farm at Nappan, N.S., and the Station at Charlottetown, P.E.I.

At Charlottetown, the plots of cereals were in excellent condition, and the small fields of grain were also very good. All gave promise of a large yield, which the threshing returns later fully confirmed. Considering that this was the first season for this new Station, the appearance of the fields and plots was remarkably good. About two days were spent in driving through some of the neighbouring parts of the Island to become familiar with agricultural conditions. The general character of the district was most attractive, and very good crops were seen on almost every farm.

The plots and fields at Nappan also gave every indication of large yields. Some damage was being done to a few plots by birds; but this seemed unavoidable, though much to be regretted, as it quite destroys the accuracy of the plot experiments.

CROSSING AND SELECTION OF CEREALS, ETC.

As the quantity of material now on hand which has been produced from the crosses accomplished during the past few years is so large as to be almost unmanageable, no new crosses in cereals were made last season. Some work was done with flax, however, using as parents the selected strains which are now being grown at Ottawa, and of which the oil-content has been determined. Aside from the scientific interest, the objects of immediate practical importance in view are to combine as far as possible in one variety a large yield and a high oil-content with such height of plant as may be most desirable. Most of the work undertaken is with a view to the production of flax seed rather than of fibre, but the latter feature is not being overlooked.

Attention is given every year to the selection of cereals not only as part of the necessary procedure to fix the various types produced by cross-breeding, but also in order to obtain improved strains of commercial sorts. The method employed is that of propagating a series of separate strains each starting with a single mother plant. The best strain is chosen after several years' study. This method, which the Cerealist

has persistently advocated for some years, is now recognized almost universally as being the best, and the older methods, which involve continuous selection through a series of years, are rapidly becoming obsolete.

DISTRIBUTION OF SAMPLES OF SEED GRAIN AND POTATOES.

The annual distribution of seed grain and potatoes, which has hitherto been under the immediate charge of the Director, has been transferred to the Cereal Division.

Certain changes in details have been made at the same time. In order that duplication may be avoided, it has been arranged that, in future, the regular distribution of samples of spring wheat, oats, barley, peas and Indian corn will be carried on from the Central Farm only, while potatoes are to be sent out from all of the principal Farms, the Central Farm supplying only the provinces of Ontario and Quebec. For this year, however, the new plans could not be fully carried out as the Branch Farms had not, in all cases, a sufficient stock of potatoes to enable them to meet the demand for samples.

It is intended that the surplus grain at the Branch Farms shall be sold for seed purposes, in quantities of (usually) two to five bushels to each purchaser.

The samples sent out free by mail are of the following weights, 5 lbs. of wheat and barley, 4 lbs. of oats and 3 lbs. of peas, Indian corn and potatoes.

Applicants writing for a sample are expected to give particulars in regard to the soil on their farm and the varieties which they have already tested, so that a suitable kind may be sent. Only one sample can be sent to one farm.

It is imperative that the crop raised from the sample should be threshed by hand. unless a very small threshing machine, which can be thoroughly cleaned, is available. Such hand threshing may involve some care and labour, but the distribution is not expected to be of benefit to farmers who are unwilling to take any trouble to propagate their grain in pure condition.

Though the distribution is not quite finished at the time of writing this report, the figures published will be revised before the report is printed so as to include the whole of the samples sent out. In this way it will be possible to publish in the present report the details in regard to the distribution carried on during the winter and spring months of 1910-11; which would otherwise not be made public until the issue of the next report a year later.

The seed grain distributed this winter was grown chiefly at Indian Head, Sask., and Brandon, Man., last season. Some of the potatoes and a small amount of the seed grain were grown at Ottawa.

The following table gives the weight per bushel and the percentage of vitality of the most important lots of seed distributed, also the farm where grown and the yield per acre on the field from which the seed was obtained.

The determinations of the vitality were made before the grain was cleaned for distribution. In most instances, the seed as distributed would show a higher percentage of germination than that given in the table.

VITALITY AND WEIGHT PER BUSHEL OF GRAIN DISTRIBUTED.

Variety.	Where and When Grown	Yield per Acre.		Weight per Measured Bushel.	Germination.
		Bush.	Lbs.	Lbs.	Per cent.
Wheat—					
Bobs	Indian Head, 1910	36	9	63	91
Early Red Fife	"	42	42	63	81
Early Red Fife	Brandon, 1910	27	..	60	97
Huron Selected	Indian Head, 1910	33	11	63	94
Marquis	"	*48	24	65	95
Preston H	"	41	11	62·5	95
Red Fife H	"	*35	19	63	95
Stanley A	"	39	42	62	92
White Fife	Brandon, 1910	31	36	62·5	100
Oats—					
Abundance	Indian Head, 1910	91	13	41·7	82
Banner	"	*85	8	39·5	92
Banner	Brandon, 1910	33	26	39 5	96
Danish Island	Indian Head, 1910	69	16	37	94
Improved Ligowo	"	69	31	41·5	92
Wide Awake	"	88	30	42	92
Barley—					
Manchurian	"	54	24	52	94
Mensury	"	67	32	51·7	98
Peas—					
Arthur Selected	"	*33	3	64	88
Golden Vine	"	*34	27	65·3	98

*Average of two fields.

SUMMARY OF DISTRIBUTION OF SAMPLES FROM CENTRAL EXPERIMENTAL FARM.

Name.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Oats	208	635	530	4,231	1,150	475	1,202	883	96
Barley	48	239	97	1,618	308	185	489	330	37
Wheat	163	464	505	3,228	403	878	3,618	1,584	81
Peas	8	170	168	732	170	130	403	305	69
Indian Corn	7	73	54	595	251	82	135	97	24
Potatoes	1	627	370	1,754	1,494	823	1,945	34	10
Total	435	2,208	1,724	12,158	3,776	2,573	7,792	3,233	317

Total number of samples distributed, 34,216.

Total number of packages of each sort distributed:—

Oats	9,410
Barley	3,351
Wheat	10,924
Peas	2,155
Indian corn	1,318
Potatoes	7,058
Total	34,216

The samples of potatoes for Prince Edward Island, Alberta and British Columbia, were sent out almost entirely from the Branch Farms or Stations in those provinces. Part of the distribution for Nova Scotia, New Brunswick, Manitoba and Saskatchewan was carried on from the Experimental Farms at Nappan, Brandon and Indian Head. The above figures include only the samples sent out from Ottawa.

The following shows the number of packages of the different varieties which have been sent from the Central Experimental Farm.

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
Oats—		Peas—	
Banner	4,424	Golden Vine	1,509
Wide Awake	1,292	Archer	401
Improved Ligowo	1,180	Arthur	170
Abundance	987	Daniel O'Rourke	75
Danish Island	803		
Thousand Dollar	698	Total	2,155
Daubeney	26		
Total	9,410	Indian Corn—	
		Compton's Early	447
		Longfellow	385
Barley (six-row)—		Angel of Midnight	328
Mensury	2,601	White Cap Yellow Dent	113
Manchurian	398	Selected Leaming	33
Barley (two-row)—		Early Mastodon	12
Standwell	195		
Invincible	154	Total	1,318
Total	3,351		
		Potatoes—	
Spring Wheat—		Gold Coin	3,391
Marquis	3,894	Rochester Rose	1,849
Red Fife	3,131	Empire State	1,187
Early Red Fife	997	Queen of Hebron	154
White Fife	838	Canadian Standard	154
Preston	728	Irish Cobbler	151
Stanley	564	Money Maker	103
Huron	388	Carman No. 1	69
Bobs	356		
Bishop	19	Total	7,058
Pringle's Champlain	9		
Total	10,924		

The number of samples of each variety distributed does not always give a correct idea as to the demand; because it occasionally happens that the supply of those sorts which are most sought after is exhausted before all the applications which have been received within the prescribed time limit have been filled.

MILLING AND BAKING TESTS.

An unusually lengthy series of milling and baking tests was carried on during the past winter. The tests included many in connection with the problems of storage of wheat and flour. Some samples of wheat grown in various sections of the United States and Canada were also examined in connection with the investigations into milling and baking methods instituted by the new Society of Milling and Baking Technology. The principal work, however, was the testing of over a hundred new cross-bred varieties of spring wheat produced at Ottawa. Among these sorts were found many of good baking strength and a few which surpassed Red Fife in this respect. Most of these are early-ripening varieties of hard, red wheat suitable for the Northwest provinces, where they will no doubt prove of great value.

For several years past, the investigations carried on in this Division in regard to problems associated with milling and baking have been mentioned only in an incomplete manner in the annual reports. It is expected that a bulletin covering these experiments will be issued before long. No attempt will, therefore, be made in this report to give a full account of the year's work in these directions.

SMALL PLOTS OF CEREALS.

In addition to the numerous small plots of cereals of cross-bred origin which are not yet fixed in character, there were grown at Ottawa last year in plots of less than one-sixtieth of an acre.

15 selected strains from named varieties of spring wheat.
186 new cross-bred varieties of spring wheat.
6 selected strains from named varieties of oats.
7 new cross-bred varieties of oats.
5 selected strains from named varieties of barley.
68 new cross-bred varieties of barley.
24 new cross-bred varieties of peas.
6 selected strains from commercial sorts of flax.

Making a total of 32 selected strains and 285 new cross-bred varieties.

The annexed plate is from a photograph taken in July, 1910, and shows in the foreground some of the small plots of cereals, and in the distance some of the sixtieth-acre plots of spring wheat.

UNIFORM TEST PLOTS OF CEREALS, ETC.

The regular test plots of grain at Ottawa are one-sixtieth of an acre each in extent, and those of field roots one-hundredth of an acre each.

The number of these test plots during the past season was as follows: Spring wheat, including the durum varieties, 102; winter wheat, 13; emmer and spelt, 16; oats, 62; six-row barley, 58; two-row barley, 39; peas, 28; spring rye, 2; winter rye, 3; field beans, 7; flax, 14; turnips, (Swedes), 20; mangels, 16; carrots, 20; sugar beets 6; Indian corn, 30; making a total of 426 plots and representing about 350 varieties and selected strains.

As compared with the previous year, the list shows a large increase in most of the grains. This is due to the introduction into the regular plots of many new, cross-bred sorts produced from the cross-fertilizing done by the Cerealist in the year 1903.

WEATHER.

The spring of 1910 opened very early, and an unusually good opportunity was afforded for sowing cereals. The sowing of the wheat plots was begun on April 13. The weather remained cool for several weeks and frost did some damage to beans and potatoes at the end of May. For cereals, however, conditions were very good until a period of rather severe drought occurred in the early summer. This did not seriously affect those plots which were situated on the best land; but on those portions of the fields where the soil was easily dried out, the crop was very greatly reduced. The later part of the season was of about a normal character.

SPRING WHEAT.

EARLY-RIPENING VARIETIES.

The most important early-ripening varieties of wheat recently introduced are Marquis and Early Red Fife. Both are beardless sorts similar to Red Fife, but ripening earlier. The kernels of Early Red Fife are indistinguishable from the ordinary Red Fife, but the kernels of Marquis are somewhat shorter and of a slightly deeper colour as a rule. Both are hard wheats, giving flour of first-class strength and colour for bread-making.

These two wheats have now been tested at various points, and while it is yet too soon to draw a final conclusion as to their relative merits, it may be said that the general opinion favours Marquis. This wheat is proving extraordinary successful in the prairie provinces. Early Red Fife has also done very well, but it appears to be rather more subject to rust than Marquis. Further experience will be needed before this point can be considered as definitely settled, but, in the meantime, Marquis can be recommended as the best early-ripening spring wheat at present available for Manitoba, Saskatchewan and Alberta.

In the eastern and western provinces, these two varieties can scarcely be said to have proved of remarkable value. Additional trials are necessary. Such sorts as Preston and Huron, though somewhat inferior in baking strength, have given excellent returns, and the advantage of Marquis and Early Red Fife from a baker's point of view counts for comparatively little in the older provinces where many farmers still continue to grow White Russian and Colorado, both very poor wheats for bread making, the latter being indeed one of the poorest sorts in cultivation.

Marquis wheat has attracted a good deal of attention outside of Canada and in response to requests received, samples have been sent for test to the United States, Great Britain, Austria, South Africa and elsewhere.

TEST OF VARIETIES AT OTTAWA.

The regular test plots of spring wheat were sown on April 13 and 14, the seed being used at the rate of about one and one-half bushels to the acre. The durum varieties were sown separately on April 22, using about one and three-quarter bushels of seed per acre. It has been thought best to include these varieties in the table with the ordinary sorts of spring wheat, so that the relative yields of the different kinds may be more readily seen.

The following table includes only the most important plots. The varieties mentioned without names are new cross-bred sorts, produced by the Dominion Cerealist, which are not yet ready for distribution. Those varieties which have a letter after the name are new strains propagated from single selected plants.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

The character of the straw is indicated by marks on a scale of ten points, according to the proportion of the plot standing erect at harvest time.

* Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 Points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inch.		Inches.	Lbs.	Bu.	Lbs.	Lbs.
1	Early Russian*	Apr. 13.	July 23..	101	44	7	3½	3,060	51	..	64·0
2	197 C	" 14.	" 22..	99	37	10	3	2,970	49	30	63·3
3	422 B	" 14.	" 24..	101	38	10	3	2,940	49	..	63·0
4	234 B	" 14.	" 24..	101	45	10	3½	2,880	48	..	62·8
5	341 A	" 14.	" 21..	98	40	10	2¾	2,850	47	30	63·5
6	Chelsea*	" 13.	" 23..	101	44	8	3½	2,790	46	30	62·0
7	427 B	" 14.	" 29..	106	50	9	4	2,790	46	30	64·2
8	Hungarian White B*	" 13.	" 24..	102	35	10	3	2,730	45	30	63·5
9	362 C. 3	" 14.	" 22..	99	42	6	2½	2,730	45	30	62·0
10	Hungarian White D*	" 13.	" 24..	102	35	10	3	2,670	44	30	64·0
11	354 C	" 14.	" 20..	97	38	10	3	2,670	44	30	63·7
12	364 C	" 14.	" 21..	98	38	9	3¼	2,610	43	30	63·0
13	410 B	" 14.	" 20..	97	42	6	3	2,610	43	30	63·2
14	Stanley A*	" 13.	" 25..	103	37	10	3½	2,580	43	..	61·0
15	397 D	" 14.	" 22..	99	42	9	3	2,580	43	..	64·0
16	351 A	" 14.	" 19..	96	38	10	3¼	2,550	42	30	63·0
17	Goose (Durum)	" 22.	Aug. 4..	104	47	5	2¾	2,550	42	30	64·0
18	334 C	" 14.	July 22..	99	38	10	3¼	2,520	42	..	65·0
19	378 A	" 14.	" 22..	99	38	10	3½	2,520	42	..	62·5
20	199 B	" 14.	" 20..	97	41	10	3	2,490	41	30	64·5
21	201 D	" 14.	" 22..	99	40	10	3¼	2.460	41	..	63·2
22	363 C	" 14.	" 24..	101	43	9	3	2,460	41	..	63·5
23	Huron Selected*	" 13.	" 24 .	102	36	10	3	2,430	40	30	63·5
24	195 F	" 14.	" 20..	97	35	10	2½	2,430	40	30	65·0
25	363 D	" 14.	" 15..	92	36	10	3	2,430	40	30	62·5
26	363 E. 1	" 14.	" 19..	96	35	10	3	2,430	40	30	63·0
27	Roumanian (Durum)	" 22.	Aug. 4..	104	50	5	2¾	2,400	40	..	65·0
28	Pringle's Champlain C.*	" 13.	July 24..	102	42	10	3¼	2,400	40	..	62·7
29	Prospect*	" 13.	" 23..	101	42	9	3½	2,400	40	..	62·0
30	86 D 2.	" 14.	" 24..	101	35	10	2½	2,400	40	..	64·0
31	177 A	" 14.	" 15..	92	40	10	3¼	2,400	40	..	62·0
32	222 B	" 14.	" 19..	96	41	9	2¾	2,400	40	..	63·5
33	Yellow Cross*	" 13.	" 20 .	98	37	10	2¾	2,370	39	30	65·0
34	106 B	" 14.	" 19..	96	36	10	3	2,370	39	30	64·0
35	446 H	" 14.	" 30..	107	48	5	3¾	2,370	39	30	64·2
36	Preston H.*	" 13.	" 24..	102	42	10	3¾	2,340	39	..	61·0
37	74 B.	Apr. 13.	July 24..	102	40	10	3	2,340	39	..	63·5
38	226 B	" 14.	" 24..	101	42	10	3½	2,340	39	..	62·5
39	362 A	" 14.	" 29..	106	44	10	3½	2,340	39	..	64·0
40	372 A	" 14.	" 23..	100	43	10	4	2,340	39	..	60·0
41	444 A	" 14.	" 24..	101	41	6	3	2,310	38	30	64·0
42	Kubanka (Durum)	" 22.	Aug. 4..	104	50	7	2½	2,310	38	30	64·0
43	Outlook*	" 13.	July 27..	105	40	10	4	2,280	38	..	63·0
44	Yellow Queen*	" 13.	" 22..	100	36	10	3	2,280	38	..	64·3
45	Bobs	" 13.	" 23..	101	40	8	3½	2,220	37	..	64·5
46	6 F 2	" 13.	" 28..	106	36	10	4½	2,220	37	..	63·0
47	107 A	" 14.	" 22..	99	42	10	3½	2,220	37	..	63·5
48	128 B	" 14.	" 25..	102	44	10	3	2,220	37	..	62·0
49	Early Red Fife*	" 13.	" 28..	106	40	10	4	2,190	36	30	64·0
50	129 D	" 14.	" 25..	102	44	10	3	2,190	36	30	64·0
51	319 B	" 14.	" 15..	92	38	10	3	2,190	36	30	63·3
52	168 B	" 14.	" 29..	106	51	9	4	2,160	36	..	63·6
53	Alpha Selected*	" 13.	" 25..	103	39	10	3¼	2,130	35	30	62·0
54	86 B	" 14.	" 19..	96	35	10	3	2,130	35	30	64·0
55	109 B	" 14.	" 22..	99	42	9	3½	2,100	35	..	65·0
56	265 B	" 14.	" 25..	102	38	10	3½	2,100	35	..	63·0
57	Red Fife H*	" 13.	" 29..	107	35	10	3¼	2,070	34	30	63·5
58	Gatineau*	" 13.	" 29..	107	44	9	3¾	2,010	33	30	62·6
59	White Fife C*	" 13.	" 29..	107	35	10	3¼	2,010	33	30	63·5
60	9 G	" 13.	" 27..	105	40	10	2½	2,010	33	30	62·1
61	135 B	" 14.	" 15..	92	41	10	2	2,010	33	30	64·9
62	Downy Riga*	" 13.	" 18..	96	46	10	3	1,980	33	..	63·0
63	83 E	" 13.	" 19..	97	35	10	3	1,980	33	..	63·7
64	113 B	" 14.	" 19..	96	42	10	2½	1,950	32	30	63·7

SPRING WHEAT—Test of Varieties.—*Concluded.*

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre	Yield of Grain per Acre	Weight per measured bushel after cleaning.
					Inch.		Inches.	Lbs.	Bu. Lbs.	Lbs.
65	Red Fife M*..	Apr. 13.	July 29..	107	35	10	3¼	1,920	32 ..	63·0
66	7 J 4	" 13.	" 29..	107	42	10	3¼	1,890	31 30	62·0
67	Aurora*....	" 13.	" 15..	93	38	8	3	1,860	31 ..	61·0
68	7 E 3........	" 13.	" 28..	106	40	10	3¼	1,800	30 ..	61·0
69	Bishop*..............	" 13.	" 23..	101	38	10	3	1,680	28 ..	63·5
70	Marquis*.........	" 13.	" 26..	104	37	10	3½	1,620	27 ..	63·0
71	Red Fern C*..........	" 13.	Aug. 4..	113	37	10	4	1,290	21 30	62·0
72	Red Fern B*..........	" 13.	" 4..	113	37	10	4	1,080	18 ..	62·5

The average yield of the 72 plots was 2,310 lbs. (38 bushels 30 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF SPRING WHEAT.

Among the ordinary sorts of spring wheat, the following varieties have shown unusual productiveness for a series of years at Ottawa: Preston, Huron, Pringle's Champlain and Bishop. The first three are hard, red wheats with bearded heads. Bishop is a beardless, early, white wheat, not usually soft in character. These four varieties are good for flour production though the flour is not in the first rank for strength and colour.

Somewhat lower in yield but superior in the strength of their flour are Red Fife, Marquis and White Fife, all beardless.

In the prairie provinces, Marquis stands very high for yield and should be used to replace the other early-maturing varieties as far as possible, on account of its greater value for export.

The durum wheats, which, owing to their peculiar character and their unpopularity with millers, should only be grown for special purposes, give good yields at Ottawa, but are especially productive in rather dry climates, where they usually produce larger crops than the ordinary types of spring wheat.

EARLIEST VARIETIES OF SPRING WHEAT.

Some very early kinds of spring wheat have been grown on this Farm for several years past but are not being distributed or recommended for general cultivation. Farmers applying for very early sorts should remember that extreme earliness is frequently associated with a rather small yield, short straw, liability to rust or some other defect to which the more vigorous wheats are less subject. Many new varieties of cross-bred origin are now under trial at Ottawa and the Branch Farms, and it is expected that one or two very early sorts of particular merit will be available for distribution in about two years.

The earliest wheats which are at present included in the regular distribution of seed grain from this Farm are Marquis and Stanley (beardless and having red kernels). Bobs and Bishop are early beardless sorts which are not generally distributed because the pale colour of their bran would cause them to be graded below their actual value in the Manitoba Inspection Division. Where this objection does not apply, they are well worthy of test. The six varieties here mentioned are all earlier in ripening than Red Fife or White Fife.

WINTER WHEAT.

The plots of winter wheat were sown on August 31, 1909, the seed being used at the rate of about one and three-quarter bushels to the acre. The soil selected for these plots was of a light and rather sandy character as it is found necessary, in the climate of Ottawa, to sow winter wheat only on land where water cannot lie in spring or during any thaw in the winter months. The wheat made good growth in the autumn, stood the winter well, and gave a large yield.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

WINTER WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.		Date of Ripening.		No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
							Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Turkey Red No. 380....	Aug.	31	July	15	318	53	3	2¼	3,270	54	30	62·5
2	Buda Pesth	"	31	"	14	317	58	10	3	3,210	53	30	63·5
3	Jones' Winter Fife.....	"	31	"	14	317	56	10	3¾	3,120	52	..	62·5
4	Dawson's Golden Chaff.	"	31	"	14	317	52	10	3½	3,090	51	30	62·
5	Early Red Clawson.....	"	31	"	14	317	57	9	3½	3,060	51	..	61·
6	Imperial Amber..	"	31	"	14	317	58	10	3½	3,060	51	..	63·
7	Red Velvet Chaff	"	31	"	14	317	59	10	3½	3,030	50	30	64·
8	American Banner......	"	31	"	14	317	52	10	3¼	2,940	49	..	62·
9	Egyptian Amber.......	"	31	"	16	319	53	9	3¾	2,820	47	..	64·
10	Tasmania Red.........	"	31	"	16	319	59	8	3¼	2,790	46	30	64·

The average yield of the ten plots was 3,039 lbs. (50 bush. 39 lbs.) per acre.

RECOMMENDED VARIETIES OF WINTER WHEAT.

The climate of Ottawa being rather too severe for the regular production of good crops of winter wheat, the average yields obtained here would scarcely serve as a satisfactory guide for farmers in southern Ontario. Some recommendations in regard to varieties of winter wheat may, however, be given.

One of the best varieties in the field is Dawson's Golden Chaff (beardless). It has the disadvantage, however, of giving flour which is low in baking strength and therefore suitable for crackers, cakes, etc., but not for light bread. The gluten content of this variety is not high enough to make it quite satisfactory for the production of rolled wheat and other similar cereal products, though it is used for these purposes.

Turkey Red (bearded) yields the strongest flour, but does not as a rule give, in Ontario, as large a yield of grain per acre as some of the other sorts.

Egyptian Amber (bearded) and Tasmania Red (bearded) give good yields of grain and produce very good flour for bread making.

Imperial Amber (bearded) is another variety which can also be recommended both for its high yield and the very fair strength of its flour.

EMMER AND SPELT.

The plots of Emmer and Spelt were sown on May 13, the seed being used at the rate of about one hundred and twenty pounds (or four bushels by measure) to the acre. The soil was a loam of medium character.

Common Emmer (often incorrectly called 'Speltz') is one of the best varieties, being less coarse and containing a larger proportion of kernel than most of the other sorts.

The varieties without names are new cross-bred sorts produced by the Dominion Cerealist.

EMMER AND SPELT—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Weight per measured bushel after cleaning
					Inches.		Inches.	Lbs.	Lbs.
1	Smooth Spelt............	April 22..	Aug. 8..	108	45	10	5	2,820	31
2	White Spelt.....	" 22..	" 8 .	108	45	10	5	2,550	30
3	Common Emmer..	" 22..	" 2..	102	35	8	2¼	2,520	41
4	44 G....................	" 13..	July 25..	103	47	10	2	2,220	45·5
5	45 E....	" 13..	" 23..	101	35	10	2	2,100	41.3
6	43 F....................	" 13..	" 29..	107	40	7	2¼	2,070	36·5
7	44 A.....	" 13..	" 29..	107	40	5	3½	2,070	39
8	44 D	" 13..	" 29..	107	46	5	2¼	2,070	42·5
9	Double Emmer............	" 22..	" 31..	100	34	6	2	2,070	31·3
10	Red Emmer..............	" 22..	Aug. 7..	107	42	10	3	2,040	37·5
11	44 F....................	" 13..	July 28..	106	40	9	2	1,980	50
12	9 K 2...................	" 22..	" 28..	97	30	10	2	1,980	35
13	9 J 3...................	" 22..	Aug. 1..	101	40	9	3½	1,890	37
14	43 E..........	" 13..	July 28..	106	38	10	2¼	1,830	36
15	55 C............	" 13 .	" 22..	100	36	10	2	1,740	43·3
16	Red Spelt...............	" 22..	Aug. 9..	109	40	10	4½	1,410	30

The average yield of the sixteen plots was 2,085 lbs. per acre.

OATS.

Alpine, Early Blonde and Swedish Black are new varieties received from Prof. G. Martinet, Director of the Botanical Station at Lausanne, Switzerland. They are early-ripening sorts of considerable interest.

The varieties under numbers are new cross-bred kinds produced at Ottawa. All of them have the Chinese Naked oat as one parent and have inherited from that variety the peculiarity of threshing out free from hull.

The oat plots were sown April 27 to 29, the seed being used at the rate of about two bushels per acre for most varieties, but in greater quantities whenever the oats were of unusually large size.

The yield per acre is expressed in pounds and also in 'bushels' of thirty-four pounds.

* Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Oats—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	American Beauty C*.....	April 27	July 29	93	35	10	7¼	2,760	81	6	35
2	Tartar King........... ...	" 28	" 25	88	40	10	8	2,760	81	6	33
3	Banner B*...............	" 27	" 29	93	38	10	8	2,670	78	18	32
4	Gold Rain (yellow)..... .	" 28	" 28	91	41	10	7½	2,550	75	..	37
5	Swedish Select.	" 28	" 28	91	40	10	8	2,550	75	..	35
6	Abundance A*...........	" 27	" 28	92	38	10	7	2,520	74	4	37·5
7	Danish Island......... ..	" 27	Aug. 1	96	35	10	7½	2,460	72	12	34
8	Swedish Ligowo	" 28	July 27	90	40	10	7½	2,460	72	12	37·8
9	Thousand Dollar.....	" 28	" 28	91	42	10	7½	2,460	72	12	36
10	American Beauty B*.	" 27	" 29	93	35	10	7¼	2,430	71	16	35
11	Improved American....	" 28	Aug. 1	95	43	10	8	2,430	71	16	33
12	Abundance D*..	" 27	July 28	92	38	10	7	2,400	70	20	36·5
13	Irish Victor.............	" 28	Aug. 1	95	44	10	8½	2,400	70	20	34
14	Bergs (black).............	" 27	July 27	91	38	10	7½	2,340	68	28	34
15	Victory................ ..	" 28	Aug. 2	96	46	8	7½	2,340	68	28	30·6
16	Excelsior................	" 28	July 27	90	36	10	7½	2,310	67	32	31
17	Black Mesdag...........	" 27	" 21	85	41	10	8	2,280	67	2	35
18	Lincoln.....	" 28	Aug. 2	96	48	8	8¼	2,280	67	2	31·5
19	Sixty Day White*........	" 28	July 15	78	33	10	5	2,280	67	2	33
20	Twentieth Century.	" 28	Aug. 1	95	44	8	7	2,280	67	2	34·2
21	Abundance C*..	" 27	July 25	89	32	10	7	2,220	65	10	35
22	Abundance, Garton's 'Re-generated'...........	" 27	" 27	91	38	10	7	2,220	65	10	37
23	Improved Ligowo........	" 28	" 31	94	44	9	7½	2,220	65	10	36
24	Daubeney Selected*.....	" 27	" 18	82	30	10	5½	2,190	64	14	35·8
25	Alpine	" 27	" 22	86	42	10	7½	2,160	63	18	34·5
26	Wide Awake.............	" 28	" 29	92	40	10	8	2,160	63	18	35·2
27	Siberian	" 28	" 31	94	38	10	8	2,100	61	26	33·5
28	White Giant Selected*....	" 28	Aug. 1	95	44	8	8½	2,100	61	26	30
29	Early Ripe E*.	" 28	July 17	80	33	10	5	2,040	60	..	35·5
30	Early Ripe F*.	" 28	" 15	78	33	10	5	2,040	60	..	32
31	Swedish Black......	" 28	" 25	88	40	10	7½	2,040	60	..	34
32	Pioneer (black)...........	" 28	" 25	88	35	10	7¼	2,010	59	4	35·8
33	White Wonder.... ...	" 28	" 19	82	36	10	8	1,980	58	8	42·5
34	Virginia White	" 28	" 31	94	46	7	8¼	1,950	57	12	32
35	Early Ripe G*.....	" 28	" 15	78	33	10	5	1,890	55	20	31
36	477 D	" 29	" 28	90	40	8	6	1,860	54	24	42·3
37	479 N....................	" 29	Aug. 2	95	45	5	7½	1,800	52	32	45
38	Early Blonde......	" 28	July 28	91	40	10	8	1,770	52	2	33
39	477 T....................	" 29	Aug. 1	94	38	5	7½	1,740	51	6	46
40	479 P...................	" 29	" 2	95	43	5	7½	1,680	49	14	38·7
41	479 Q....................	" 29	" 3	96	46	3	8	1,650	48	18	42
42	480 A..........	" 29	July 30	92	42	5	6½	1,650	48	18	46·8
43	479 B	" 29	Aug. 3	96	40	7	7¼	1,620	47	22	43
44	477 G....................	" 29	July 30	92	40	5	8	1,590	46	26	45·5
45	479 D........	" 29	" 27	89	38	5	6	1,590	46	26	49
46	477 Q....	" 29	Aug. 7	100	42	6	7	1,560	45	30	43
47	479 A....................	" 29	" 2	95	40	5	7¼	1,350	39	24	44·5
48	480 J..................	" 29	July 28	90	38	5	6½	1,290	37	32	48
49	480 L....................	" 29	" 28	90	38	9	7	1,290	37	32	47·5
50	477 H	" 29	Aug. 7	100	40	3	7	1,080	31	26	40

The average yield of the fifty plots was 2,072 lbs. (60 bush. 32 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF OATS.

Among the most productive kinds of oats, the following white varieties deserve special mention: Thousand Dollar, Twentieth Century, Improved American, Banner, Garton's Abundance and Danish Island. One or more of these kinds can be obtained from any good seedsman. Gold Rain is a very productive yellow oat. Among black oats, the English varieties, Pioneer and Excelsior, have given the best returns on the Central Farm during the past few years, but they have not proved so productive as the best white kinds.

EARLIEST VARIETIES OF OATS.

The varieties called Sixty Day and Early Ripe are extremely early in ripening, but cannot be recommended for general purposes, though they may be useful in certain special cases.

Somewhat less early, but probably more satisfactory as a rule, are Daubeney and Tartar King. These oats are obtainable in commerce, but farmers will usually find some of the later varieties more productive.

SIX-ROW BARLEY.

The plots were sown on April 22 to 27, the seed being used at the rate of about two bushels to the acre. The land on which it was necessary to place the plots varied so much in character, within short distances, that the yields given in the following table have not much significance.

The variety known as O.A.C. No. 21 is a selected strain produced by Prof. C. A. Zavitz, of Guelph, Ontario, from Mandscheuri barley.

Early Indian is a selected strain from a very early barley grown at high elevations in northern India.

The yield per acre is expressed in pounds, and also in 'bushels' of forty-eight pounds.

The varieties under numbers are new cross-bred sorts produced by the Dominion Cerealist. Many of them are hulless, as may be seen from their high weight per bushel.

* Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

SIX-ROW BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Odessa C*	April 22	July 16	85	36	8	3	3,780	78	36	47
2	Alber *	" 22	" 16	85	40	9	3	3,720	77	24	46·5
3	Mandscheuri	" 22	" 19	88	42	4	3	3,720	77	24	47
4	Mensury	" 22	" 16	85	40	5	2¾	3,720	77	24	46·3
5	Black Japan	" 22	" 18	87	34	10	2¼	3,660	76	12	48·2
6	Taganrog A*	" 22	" 19	88	32	6	2½	3,630	75	30	47
7	Manchurian H*	" 22	" 16	85	38	8	3¼	3,540	73	36	47
8	Oderbruch	" 22	" 18	87	37	10	3¼	3,420	71	12	49
9	O.A.C. No. 21	" 22	" 16	85	40	9	2½	3,390	70	30	47·1
10	Manchurian G*	" 22	" 16	85	38	10	3¼	3,360	70	..	48
11	Escourgeon	" 22	" 19	88	37	9	3	3,300	68	36	47·5
12	Odessa D*	" 22	" 19	88	36	10	3	3,300	68	36	50
13	Stella A*	" 22	" 17	86	35	10	3	3,300	68	36	49·5
14	Manchurian A*	" 22	" 18	87	38	4	3¼	3,270	68	6	46
15	Stella C*	" 22	" 16	85	35	10	3	3,120	65	..	49·1
16	Blue Short Head C*	" 22	" 23	92	28	10	1¾	3,000	62	24	46
17	Nugent*	" 22	" 16	85	32	10	3¼	3,000	62	24	47·6
18	476 E	" 27	" 25	89	26	10	2	3,000	62	24	46
19	Blue Short Head A*	" 22	" 23	92	28	10	1¾	2,940	61	12	48
20	Stella G*	" 22	" 15	84	29	10	3	2,940	61	12	48·5
21	Trooper*	" 22	" 16	85	33	10	3	2,850	59	18	48
22	Small Blue Naked	" 22	" 22	91	30	9	3¼	2,790	58	6	59·2
23	Mansfield*	" 22	" 19	88	36	9	2½	2,760	57	24	49
24	471 D 3	" 27	" 16	80	27	9	1½	2,730	56	42	61·5
25	Claude*	" 22	" 15	84	31	10	2¾	2,700	56	12	49
26	Odessa F*	" 22	" 15	84	29	10	3	2,610	54	18	48·5
27	462 D	" 23	" 20	88	32	8	2	2,610	54	18	62
28	Success B*	" 22	" 12	81	36	10	2½	2,460	51	12	46
29	460 A 2	" 25	" 15	81	30	9	1¾	2,460	51	12	63
30	472 A	" 27	" 18	82	29	8	2¼	2,310	48	6	62
31	463 A	" 25	" 15	81	28	10	2	2,220	46	12	51
32	476 C	" 27	" 25	89	27	10	2¼	2,190	45	30	44
33	464 A	" 25	" 16	82	26	10	2	2,160	45	..	61·5
34	475 C	" 27	" 21	85	21	10	2½	2,130	44	18	47
35	Early Indian*	" 22	" 10	79	32	8	1¾	2,100	43	36	45
36	464 E	" 25	" 17	83	30	10	2¼	2,100	43	36	60
37	469 B	" 27	" 25	89	26	10	2¼	2,100	43	36	61 5
38	471 C	" 27	" 29	93	27	10	2½	2,010	41	42	59
39	462 C	" 23	" 20	88	30	10	2¼	1,980	41	12	61
40	476 D	" 27	" 25	89	26	10	2	1,950	40	30	43
41	465 B	" 25	" 18	84	26	10	2	1,920	40	..	62·3
42	469 D	" 27	" 25	89	26	10	2¼	1,890	39	18	60
43	466 A	" 25	" 15	81	24	10	2	1,800	37	24	59·2
44	460 A	" 23	" 14	82	26	10	1½	1,740	36	12	61
45	459 B	" 23	" 16	84	22	10	1	1,620	33	36	62
46	468 B	" 27	" 25	89	20	10	2	1,620	33	36	60
47	475 B	" 27	" 15	79	24	10	2	1,560	32	24	43
48	467 B	" 27	" 16	80	25	10	2	1,530	31	42	61
49	462 B	" 23	" 16	84	22	10	1½	1,500	31	12	62
50	468 A	" 27	" 22	86	20	10	2½	1,350	28	6	58·5
51	467 C	" 27	" 19	83	20	10	2	1,110	23	6	59

The average yield of the fifty-one plots was 2,588 lbs. (53 bush. 44 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF SIX-ROW BARLEY.

Among the most productive sorts which have been tested for several years at this Farm are Manchurian A and Odessa. Manchurian is a selected strain of Mensury. This selection has surpassed in yield both the original Mensury from which it was derived and the closely-related Mandscheuri. These two are therefore being discontinued.

EARLIEST VARIETIES OF SIX-ROW BARLEY.

Manchurian and Odessa are among the earliest sorts of six-row barley that have been tested. Some of the new varieties, which appear in the plots this year for the first time, mature more rapidly. These are not yet available for distribution.

BEARDLESS SIX-ROW BARLEY.

The variety known as Champion has been discontinued, and a selection made from Success is being grown instead. Success is earlier than Champion, but neither variety gives a large yield. Several of the new cross-bred sorts mentioned in the list for the first time this year are beardless. It is hoped that some of them will prove superior to the older, named sorts.

HULLESS SIX-ROW BARLEY.

The common sorts of hulless barley known as Hulless White and Hulless Black are characterized by such weak straw that they have been dropped from our list. Several of the new cross-bred sorts introduced this year are hulless and some of them display a fair strength of straw.

TWO-ROW BARLEY.

The plots were sown on May 22 to 27. The seed was used at the rate of about two bushels to the acre. The soil varied considerably in character, which caused very irregular returns from the plots.

The new early-ripening variety grown under the name Kutais is a selected strain from a Russian barley.

The varieties under numbers are new cross-bred sorts produced by the Dominion Cerealist.

* Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Two-Row Barley—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Kutais*	April 23	July 15	83	32	9	3	2,910	60	30	53
2	Gordon E*	" 23	" 17	85	34	10	2½	2,610	54	18	54
3	Early Chevalier*	" 23	" 15	83	32	10	2¾	2,580	53	36	53
4	Gordon A*	" 23	" 15	83	34	10	2½	2,460	51	12	53
5	Leader.	" 23	" 25	93	26	10	2½	2,460	51	12	52
6	Gordon D*	" 23	" 17	85	34	10	2½	2,430	50	30	53
7	Duckbill C*	" 23	" 22	90	25	10	2½	2,400	50	..	51·3
8	Swan's Neck	" 23	" 20	88	27	10	2½	2,400	50	..	51
9	Invincible	" 23	" 25	93	26	10	2¾	2,340	48	36	51·5
10	Canadian Thorpe D*	" 23	" 25	93	25	10	2½	2,280	47	24	53
11	Hannchen	" 23	" 18	86	24	10	2¾	2,280	47	24	53
12	Caucasian Hulless	" 23	" 14	82	28	10	3	2,220	46	12	61·5
13	Duckbill B*	" 23	" 22	90	25	10	2½	2,220	46	12	52
44	Gordon B*	" 23	" 15	83	34	10	2½	2,220	46	12	49
15	Black Two-row,	" 22	" 27	96	24	10	3	2,190	45	30	52·2
16	Canadian Thorpe E*	" 23	" 25	93	25	10	2½	2,190	45	30	53
17	French Chevalier	" 23	" 20	88	30	10	3	2,160	45	..	53·5
18	Jarvis*	" 23	" 19	87	36	10	4	2,130	44	18	52
19	Primus	" 23	" 25	93	26	10	3	2,100	43	36	54
20	Standwell	" 23	" 20	88	31	10	3¼	2,100	43	36	53
21	Beaver B*	" 22	" 16	85	28	10	4	1,920	40	..	50
22	Swedish Chevalier	" 23	" 27	95	27	10	3¼	1,920	40	..	54
23	476 B	" 27	Aug. 1	96	28	10	2¾	1,920	40	..	46
24	Beaver D*	" 22	July 16	85	28	10	4	1,800	37	24	51
25	Beaver E*	" 22	" 16	85	28	10	4	1,800	37	24	51
26	Jewel	" 23	" 31	99	24	10	3½	1,800	37	24	51
27	476 A	" 27	" 25	89	27	10	3½	1,800	37	24	48
28	Hofbrau	" 23	" 28	96	25	10	4	1,680	35	..	52·5
29	475 M	" 27	" 15	79	28	10	3	1,680	35	..	50
30	Clifford*	" 23	" 18	86	30	10	3½	1,530	31	42	50
31	475 E	" 27	" 23	87	28	10	3½	1,530	31	42	48·5
32	Danish Chevalier	" 23	" 28	96	25	10	3½	1,170	24	18	51
33	475 J	" 27	" 25	89	25	10	3	1,170	24	18	47·5
34	475 D	" 27	Aug. 1	96	22	10	2½	1,140	23	36	52

The average yield of the 34 plots was 2,045 lbs. (42 bushels 29 lbs.) per acre.

MOST PRODUCTIVE VARIETIES OF TWO-ROW BARLEY.

The following varieties are among the most productive: Hannchen (a Swedish selection of the famous Hanna barley), Swan's Neck, Standwell, Clifford, Canadian Thorpe, Beaver and the different strains of Chevalier.

EARLIEST VARIETIES OF TWO-ROW BARLEY.

Among the earlier sorts are Hannchen, Beaver, Clifford and some strains of Chevalier.

BEARDLESS AND HULLESS TWO-ROW BARLEY.

The varieties of beardless and of hulless two-row barley which have been tested at Ottawa have not, as a rule, shown sufficient strength of straw to make them profitable sorts for farmers to cultivate. The variety called Caucasian Hulless, which has now been tested for four years, has given good yields, but it cannot be recommended without further trial, as the straw has shown decided indications of weakness in some seasons.

Small plots of Cereals in foreground. Sixtieth-acre plots of Spring Wheat in the distance, at Central Experimental Farm, Ottawa, July, 1910.

16—p. 152.

PEAS.

The plots of peas were sown April 27, the seed being used at the rate of two or three bushels to the acre, according to the size of the pea.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

Varieties under numbers are new cross-bred sorts produced by the Dominion Cerealist.

* Named varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
						Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.
1	Prussian Blue..........	Medium	April 27	Aug. 8	103	60	2¼	2,580	43	.	64
2	Wisconsin Blue..........	"	" 27	" 11	106	75	2¼	2,520	42	.	64
3	Prince*................	Large..	" 27	" 8	103	65	2¼	2,490	41	30	64
4	White Marrowfat........	" ..	" 27	" 11	106	75	2½	2,460	41	.	64
5	English Grey..........	Medium	" 27	" 11	106	60	2	2,280	38	.	62
6	Picton*..............	" ..	" 27	" 6	102	65	2¼	2,010	33	30	64
7	Golden Vine............	Small..	" 27	" 8	103	55	2	1,920	32	.	64·5
8	37 D..................	Medium	" 27	" 3	98	40	2¼	1,890	31	30	61
9	22 E..................	" ..	" 27	" 11	106	60	2¼	1,860	31	.	62
10	Zulu..................	Large..	" 27	" 9	104	70	2½	1,800	30	.	60
11	31 C..................	Medium	" 27	" 5	100	38	1¾	1,800	30	.	64
12	Daniel O'Rourke........	Small..	" 27	" 8	103	65	2	1,650	27	30	63·5
13	Paragon*..............	Medium	" 27	" 2	97	45	2¼	1,530	25	30	63
14	Chancellor............	Small..	" 27	" 1	96	60	2¼	1,440	24	.	64
15	20 E..................	Medium	" 27	" 3	98	50	2¼	1,350	22	30	64
16	35 D..................	" ..	" 27	" 3	98	40	2	1,350	22	30	62
17	36 A..................	" ..	" 27	July 29	93	35	1¾	1,320	22	.	63
18	19 F..................	" ..	" 27	Aug. 1	96	30	2¼	1,260	21	.	64
19	Mackay*..............	" ..	" 27	" 2	97	50	2½	1,200	20	.	64
20	37 B..................	" ..	" 27	" 8	103	65	2¼	1,110	18	30	63·2
21	Canadian Beauty........	Large..	" 27	" 9	104	60	2¼	1,080	18	.	63·5
22	30K 2..................	Medium	" 27	July 29	93	45	2¼	1,080	18	.	64·5
23	Arthur Selected*......	" ..	" 27	" 29	93	30	1¾	990	16	30	65
24	19 B 1................	" ..	" 27	Aug. 2	97	35	2	840	14	.	61
25	37 E..................	" ..	" 27	July 29	93	30	2¼	780	13	.	60
26	Black-Eye Marrowfat....	Large..	" 27	Aug. 11	106	50	2¼	750	12	30	63·5
27	23 H..................	" ..	" 27	July 29	93	30	2	570	9	30	61
28	23 R 1................	Medium	" 27	Aug. 11	106	25	1¾	540	9	.	64

The average yield of the 28 plots was 1,445 lbs. (24 bushels 5 lbs.) per acre.

RECOMMENDED VARIETIES OF PEAS.

Prussian Blue, Arthur and Chancellor are among the most productive sorts, and are also early in ripening. The Marrowfat varieties and Golden Vine are somewhat later in maturing. Most of these varieties can be obtained from seedsmen in Canada.

SPRING RYE.

The plots of spring rye were sown on April 22, the seed being used at the rate of about one and one-half bushels to the acre.

The yield per acre is expressed in pounds and also in 'bushels' of fifty-six pounds.

SPRING RYE—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Ottawa Select..........	April 22	Aug. 2	102	60	5	$3\frac{1}{2}$	3,060	54	36	58
2	Common...............	" 22	" 2	102	60	5	$3\frac{1}{2}$	2,880	51	24	59

The average yield of the two varieties was 2,970 lbs. (53 bushels 2 lbs.) per acre.

WINTER RYE.

The plots of winter rye were sown on August 31, 1909, the seed being used at the rate of about one and one-half bushels to the acre. The rye made good growth in the autumn and stood the winter well.

The yield per acre is expressed in pounds and also in 'bushels' of fifty-six pounds.

WINTER RYE—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Dominion.....	Aug. 31	July 18	321	72	7	$4\frac{1}{2}$	2,520	45	..	56
2	Mammoth White........	" 31	" 18	321	74	6	4	2,100	37	28	54·5
3	Thousandfold	" 31	" 18	321	74	5	$4\frac{1}{4}$	1,860	33	12	52·2

The average yield of the three varieties was 2,160 lbs. (38 bush. 32 lbs.) per acre.

FIELD BEANS.

Seven plots of beans, one-sixtieth of an acre each, were sown on May 16. All of the varieties sown were selected strains of field beans or of early-maturing garden sorts which may prove useful in localities where it is desired to obtain ripe seed in a short season.

The yield per acre is expressed in pounds and also in 'bushels' of sixty pounds.

FIELD BEANS—Test of Varieties.

Number.	Name of Variety.	Distance between Rows.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Plant.	Average Length of Pod.	Yield of Seed per Acre.	Yield of Seed per Acre.		Weight per measured bushel after cleaning
		In.				In.	In.	Lbs.	Bush.	Lbs.	Lbs.
1	Norwegian Brown Selected .	16	May 16	Aug. 17	93	12	4	1,800	30	..	61·5
2	Golden Wax Selected.	16	" 16	" 17	93	12	3½	1,470	24	30	65
3	White Field Selected.......	20	" 16	" 28	104	17	3½	1,080	18	..	64·5
4	Challenge Black Wax Sel...	16	" 16	" 9	85	10	3	960	16	..	59·
5	Marrowfat Selected.........	20	" 16	" 30	106	24	4	960	16	..	66·
6	California Pea Selected.....	16	" 16	" 30	106	12	3½	810	13	30	64·5
7	Stringless Kidney Wax Sel..	16	" 16	" 17	93	10	2¾	750	12	30	63·

The average yield of the seven varieties was 1,118 lbs. (18 bush. 38 lbs.) per acre.

FLAX.

As mentioned in the last report, it has been found necessary to make selections from the various commercial sorts of flax in order to obtain uniform types. Fourteen of these new selections were grown in sixtieth-acre plots in 1910, and thirteen of them are being retained for further trial.

The seed was sown on May 23, at the rate of sixty pounds to the acre. The unfavourable, dry weather caused the crop to be small.

The yield of seed per acre is expressed in pounds and also in 'bushels' of fifty-six pounds.

FLAX—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Average Length of Plants.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.	Lbs.	Bush.	Lbs.	Lbs.
1	La Plata B..........................	May 23	Aug. 22	91	24	840	15	..	52·8
2	Novarossick B	" 23	" 20	89	26	840	15	..	54·2
3	White Flowering B....	" 23	" 8	77	28	840	15	..	55·5
4	Russian A................	" 23	" 7	76	28	750	13	22	56·5
5	La Plata A.....	" 23	" 24	93	24	720	12	48	53·5
6	White Flowering A...................	" 23	" 6	75	28	720	12	48	55·3
7	La Plata C...........................	" 23	" 12	81	25	600	10	40	54
8	Common D..........................	" 23	" 8	77	28	570	10	10	56
9	Russian B	" 23	" 7	76	34	540	9	36	55
10	Common A..........................	" 23	" 8	77	32	450	8	2	55·3
11	Common C.................	" 23	" 8	77	32	450	8	2	56·5
12	Common B................	" 23	" 8	77	32	360	6	24	56
13	Common S..........................	" 23	" 8	77	38	300	5	20	55

The average yield of the thirteen varieties was 614 lbs. (10 bush. 54 lbs.) per acre.

FIELD ROOTS.

The advantage of late pulling for field roots having been clearly proved by the experience of several years, comparative tests, by pulling on two different dates about two weeks apart, have been discontinued. All the roots were harvested at the one time but the harvesting was left until quite late, so as to enable the roots to make as large a growth as possible.

The yield per acre of the field roots is calculated from the weight of the crop gathered from one-hundredth of an acre.

The soil on which the field roots were grown was a heavy loam.

It is probable that, in some instances, varieties which are mentioned in these tables under different names are identical in all essential respects.

In Canada the ton contains 2,000 pounds.

TURNIPS (SWEDES).

Two sowings were made of each variety, the first on May 12, and the second on May 26. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about eight or ten inches apart in the rows.

The roots were pulled on October 25.

TURNIPS (SWEDES)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Bangholm Selected	36	350	25	800
2	Hall's Westbury	34	1,300	28	1,500
3	Good Luck	34	500	31	600
4	Magnum Bonum	34	..	30	1,000
5	Carter's Elephant	30	1,700	22	100
6	Jumbo	30	1,500	24	700
7	Halewood's Bronze Top	30	400	25	1,200
8	Perfection Swede	28	800	25	1,100
9	Mammoth Clyde	27	100	21	400
10	Hartley's Bronze	26	1,000	26	..

The average yield from the first sowing was 31 tons 565 lbs. per acre.

The average yield from the second sowing was 26 tons 140 lbs. per acre.

MANGELS.

Two sowings were made of each variety, the first on May 12 and the second on May 26. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about twelve inches apart in the rows. The roots were pulled October 26.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Selected Yellow Globe	70	200	43	..
2	Yellow Intermediate	63	600	40	..
3	Giant Yellow Intermediate	60	600	50	..
4	Half Sugar White	58	1,600	47	200
5	Perfection Mammoth Long Red	56	400	40	1,600
6	Giant Yellow Globe	50	1,600	47	800
7	Prize Mammoth Long Red	50	1,000	46	600
8	Gate Post	38	800	33	700

The average yield from the first sowing was 43 tons 988 lbs. per acre.
The average yield from the second sowing was 56 tons 100 lbs. per acre.

CARROTS.

Two sowings were made of each variety, the first on May 12, and the second on May 26. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about six inches apart in the rows. The roots were pulled October 27.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre from 1st Sowing		Yield per Acre from 2nd Sowing.	
		Tons	Lbs.	Tons.	Lbs.
1	Half Long Chantenay	41	200	33	..
2	Mammoth White Intermediate	37	100	34	1,300
3	Improved Short White	35	1,700	35	800
4	Ontario Champion	32	800	29	800
5	White Belgian	27	1,400	27	700

The average yield from the first sowing was 34 tons 1,640 lbs. per acre.
The average yield from the second sowing was 31 tons 1,920 lbs. per acre.

SUGAR BEETS.

Two sowings were made of each variety, the first on May 12, and the second on May 26. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about six inches apart in the rows. The roots were pulled on October 27.

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	French Very Rich	28	800	20	400
2	Klein Wanzleben	24	100	19	1,800
3	Vilmorin's Improved	23	500	19	1,500

The average yield from the first sowing was 25 tons 466 lbs. per acre.
The average yield from the second sowing was 19 tons 1,900 lbs. per acre.

INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown May 17, and the corn was cut green for ensilage September 17. The yield has been calculated from the weight of crop cut from two rows, each sixty-six feet long. The soil was a rather heavy loam.

For the making of ensilage, the corn should be cut when the kernels are in the doughy stage; but the summer at Ottawa is not always warm enough to bring the late varieties to this stage of maturity before it is necessary to cut the crop to avoid serious frost.

In Canada the ton contains 2,000 pounds.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre Grown in Rows.		Weight per Acre Grown in Hills.	
				Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Eureka	May 17	Sept. 17	115	Early milk	36	600	36	50
2	Champion White Pearl	" 17	" 17	100	"	30	1,160	25	100
3	Compton's Early	" 17	" 17	100	Doughy	29	1,620	27	10
4	Superior Fodder	" 17	" 17	130	Early milk	29	1,620	27	450
5	Wood's Northern Dent	" 17	" 17	105	"	29	1,510	33	220
6	Angel of Midnight	" 17	" 17	75	Glazed	28	650	23	860
7	Selected Leaming	" 17	" 17	118	Doughy	28	650	23	530
8	Early Mastodon	" 17	" 17	100	Glazed	25	50	19	720
9	Longfellow	" 17	" 17	105	"	24	730	25	330

The average yield from the first sowing was 25 tons 466 lbs. per acre.
The average yield from the second sowing was 19 tons 1,900 lbs. per acre.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming and Longfellow. The seed was sown May 17, and the corn was cut for ensilage September 17. Sixteen rows of each variety were sown; that is, four rows at each of

the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was sixty-six feet.

Name of Variety.	Distance between the Rows.	Character of Growth.	Height.	Condition when Cut.	Weight per Acre Grown in Rows.	
	Inches.		Inches.		Tons.	Lbs.
Champion White Pearl..........	21	Strong........	110	Early milk...	31	1,693
" "	28	Very strong ..	115	" ...	31	1,450
" "	35	Strong........	100	" ...	30	1,160
" "	42	Very strong ..	125	" ...	36	920
Selected Leaming................	21	Strong.......	105	Doughy	28	700
" "	28	Very strong ..	115	"	32	155
" "	35	" ..	118	"	28	650
" "	42	" ..	120	"	27	1,930
Longfellow...................	21	Strong........	100	Glazed......	26	542
"	28	Very strong ..	105	"	25	760
"	35	" ..	105	"	24	730
"	42	" ..	120	"	27	520

POTATOES.

The land that is available each season for potatoes is divided into small fields, such varieties being grown as will be of service in the annual distribution of samples from this Farm. The areas devoted to the different varieties vary considerably, but they are usually from one-half to one and one-half acres. The variety called Gold Coin was grown in three small fields. Rot was prevalent on most varieties, but Gold Coin was almost free from disease. This was partly due to the lighter character of the soil on which this sort was planted.

The dates of planting were from May 13 to June 1, and the harvesting from October 11 to the 15th.

The following table gives the yield per acre (of sound potatoes only) expressed in pounds and also in 'bushels' of sixty pounds.

FIELD PLOTS OF POTATOES.

Number.	Variety.	Time of Maturing.	Colour.	Yield per Acre.	Yield per Acre.
				Lbs.	Bush.
1	Gold Coin....................	Mid-season to late.........	White........	9,345	155
2	"	" "	"	8,360	139
3	"	" "	"	8,090	134
4	Irish Cobbler................	Early..................	"	7,600	126
5	Money Maker	Medium................	"	7,500	125
6	Rochester Rose..	Very early................	Pink..........	7,365	122
7	Carman No. 1................	Mid-season to late	White........	4,120	68

REPORT OF THE DOMINION CHEMIST.

FRANK T. SHUTT, M.A., F.I.C., F.C.S., F.R.S.C.

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-fourth Annual Report of the Chemical Division of the Experimental Farms.

In continuance of the policy followed since the establishment of the Division we have, in addition to the prosecution of research and investigation in connection with problems affecting the general agriculture of the Dominion, endeavoured to assist the practical farmer in his everyday work. This latter involves the examination of many samples of an agricultural nature sent in by farmers and the giving of advice, in response to inquiries, in matters relating to the management of soils, the value, care and use of farm manures, the nature and choice of fertilizers, the nutritive values of fodders and feeding stuffs, the composition and preparation of insecticides and of fungicides and many other allied subjects. As this branch of our work continues to increase, it will be evident that the annual report can contain but a part of the labours of the year. It is gratifying, in this connection, to be able to record the wide appreciation of this phase of the work; farmers are more and more availing themselves of the opportunity offered to obtain information on many matters of prime importance to them.

During the year, Bulletin No. 6 (Second Series) entitled 'Western Prairie Soils; their Nature and Composition,' has been issued. It gives in concise form the results and conclusions of our work during the past twenty years on the soils of the great plains and satisfies a demand that has long been felt, both in Canada and elsewhere, for information respecting the nature and fertility of the soils of the Northwestern provinces. Our data have established the great uniformity, the richness in plant food and the favourable physical condition of the soils covering large areas and they have also shown that exclusive grain growing and fallowing, now so commonly the practice, must give place to more rational methods of farming if these prairie soils are to be maintained in their present high state of fertility.

In the accompanying pages will be found the results of the more important investigations carried on since April 1, 1910, several of which have been under study for a number of years past. It will be noticed that these researches cover a wide field and furnish information of a useful and practical nature to those engaged in the specialized branches as well as to those in general farming.

Wheat and Flour.—In 1905, we began the study of the influence of environmental conditions on the composition of the wheat-grain and, as a result, evidence of a very satisfactory character is now available to show that soil moisture, more particularly during the development and ripening of the kernel, is an important factor in determining the gluten-content of the grain. It would seem that conditions which bring about a rapid maturation, *e.g.*, high temperatures and absence of excessive moisture

produce a 'hard' glutinous wheat, while on the other hand, cool and wet seasons, which would prolong the vegetative period and delay ripening, result in a 'soft,' starchy grain. Other things being equal, the soil moisture-content has been found to markedly influence the character of the grain. Thus, very considerable differences have been observed between wheat grown under 'dry farming' conditions and under irrigation in Southern Alberta, the product from the former being much the richer in gluten

In this investigation we have now included barley, and the results, generally, accord with those from wheat. They show that the grain grown under irrigation has a much lower protein-content than that from 'dry' areas. This work was conducted in Southern Alberta, and our finding points to the strong probability that a low protein barley, particularly valuable for malting, can be grown on irrigated areas in that province.

The study to ascertain the influence of age on the quality of wheat and flour has been further prosecuted. This investigation, commenced in 1907, has been carried on in conjunction with the Dominion Cerealist who planned the details of the experiment and conducted the milling and baking tests. In this Division, the intention was to learn what changes in the composition of the wheat and flour might occur during storage and, if any, to correlate them with the baking results. The analytical data obtained at the end of the first storage period—16 months—were reported in 1909, and showed that certain changes, though minor in character, had taken place. The data from the recent analyses now presented do not record significant changes in the samples during the second storage period—January, 1909, to January, 1911.

Nitrogen enrichment of Soils through the growth of Clover.—The soil of this plot, an exceedingly poor, sandy loam at the beginning of the experiment, 1902, has again been sampled and analysed. Its nitrogen-content continues to increase, though the rate of increase shows a falling off as the land is longer and longer under experiment. In the nine years, the nitrogen-content of the soil has practically doubled.

Cultural Methods as affecting Soil Moisture.—The effect of sub-surface packing on the soil moisture-content has again been studied, the work of the past year being carried on at Lethbridge, Southern Alberta. The results are somewhat more favourable to the practice than those previously reported, but it is quite evident that the physical character of the soil has much to do with the benefit to be derived from this operation—the lighter soils receiving the greater advantage.

Inoculation for the Growth of Legumes.—No indications of material advantage have been observed from the use of 'cultures' for clover and alfalfa on the trial plots on the Experimental Farm, Ottawa. It would seem from our work, not only of this year but of previous seasons, that special inoculation is not *generally* necessary on the older cultivated lands that have been kept in good condition by rational methods of farming. This statement is not at variance with the experience of many in the northwestern provinces, where inoculation has frequently proved most effective. There the land is at the present time virgin, or practically so, and, not having borne crops of clover or alfalfa, it does not contain the necessary nitrogen-fixing bacteria which play the useful part of enriching their hosts with nitrogen, and thus encouraging growth.

Field Roots and Sugar Beets.—The composition of mangels, turnips and carrots as grown during the past season on the Experimental Farm, Ottawa, is given, and from the data is deduced the relative feeding value of the varieties under experiment.

The factory values of the three leading varieties of sugar beets grown for the production of sugar, have been determined. The roots analysed were grown on the several Experimental Farms, and consequently the results, which are quite satisfac-

tory, indicate what is possible in growing beets suitable for sugar extraction at widely distant points in the Dominion.

Fertilizing materials.—Under this caption, the manurial value of a considerable number of naturally-occurring materials is discussed. These include mucks, muds, peats, marls, limestone, gypsum, etc., etc., analysed during the year. An account of our examination of several varieties of sea-weed collected in the lower St. Lawrence is also given, the analyses showing the very considerable value of this material for supplying potash and nitrogen.

The Fertilizing Value of Rain and Snow.—The fourth year's work in this investigation is presented. The total amount of nitrogen thus furnished, per acre, during the year ending February 28, 1911, was 5·271 lbs., of which 4·424 lbs. was contained in the rain and ·847 lbs. in the snow.

Well Waters from Farm Homesteads.—The examination of waters from farmers' wells, dairies and cheese factories is a work we have always considered of much practical value. The data are given for the past season's work in this connection, together with a brief report as to quality and wholesomeness.

Samples received for Examination.—A classified list of the samples received for examination during the past year is presented in the following table:—

SAMPLES RECEIVED FOR EXAMINATION AND REPORT FOR THE TWELVE MONTHS ENDED MARCH 31, 1911.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	95	88	56	22	20	33	4	16	1	335	149
Muds, mucks and marls	8	1	1	....	4	3	5	7	8	37	7
Manure and fertilizers	3	....	....	....	14	32	....	9	1	59	1
Forage plants and fodders	9	15	5	8	90	8	2	17	4	158	25
Waters	12	10	17	8	189	42	5	3	3	289	....
Miscellaneous, including dairy products, preservatives, fungicides and insecticides	2	6	5	4	128	42	3	18	4	212	18
Totals	129	120	84	42	445	160	19	70	21	1,090	200

While every effort is made to furnish information respecting samples of a purely agricultural nature, we wish to advise our readers that it does not come within our province to analyse and report upon food stuffs and commercial fertilizers. Correspondents desiring such analyses should communicate with the Inland Revenue Department, Ottawa. Nor can we undertake the assays or analyses of minerals or mineral waters. Questions relating to minerals may be addressed to the Department of Mines, Ottawa. And lastly, we cannot make any analysis, the results of which we do not consider of general value to the agricultural public. Examination in connection with suspected poisoning cases of animals is not undertaken.

There is always a large amount of analytical work in hand, and it is seldom possible on receipt of the sample to proceed immediately with its analysis, and we beg our correspondents to bear this in mind. As far as may be practicable, samples and correspondence are dealt with in the order received.

Meat Inspection Division, Health of Animals Branch, Department of Agriculture.—For the past three years, the work of examination of samples sent in by the Meat Inspection Division has been carried out in the Farm laboratories. Between March 31, 1910, and April 1911, we analysed and reported upon eighty-six samples, a classification of which is as follows:—

	Samples.
Lard, beef fat and tallow	13
Dye stuffs and colouring matters	36
Preservatives and pickling solutions	28
Spices and condiments	5
Preserved meats	2
Fillers for sausages	2
	86

These had been collected by the Government Meat Inspectors at the various packing houses in the Dominion.

The chemical and microscopical work involved in the examination of these samples had for its object the determination of their nature and purity.

The Staff—Acknowledgments.—The two vacancies on the staff referred to in our last report were filled by competitive examination in July last. At the same time and in the same manner, a further and third appointment was made, chiefly that we might be enabled to more effectively deal with the work submitted by the Meat Inspection Division, which had increased very considerably. The Assistant Chemists thus added to the staff are Mr. E. Blake Carruthers, M.A., Mr. C. H. Robinson, B.A., and Mr. A. T. Stuart, B.A., to all of whom I would tender my thanks for much valuable assistance in carrying on the work of the Division. My thanks are also due to Mr. A. T. Charron, M.A., who for the past thirteen years has held the post of First Assistant Chemist, and who has continued to discharge the varied duties that devolve upon him with skill and faithfulness and to my entire satisfaction.

And now, in conclusion, may I be permitted to express my regret at learning that advancing years and impaired health have compelled you to relinquish the work you have so long and so successfully carried on as Director of the Dominion Experimental Farms. We have been associated since the establishment of the Farm system and I would thank you for many kindnesses and an ever-ready and keen appreciation of my work, during that long period. I hope that with restored health you may long be spared to enjoy your well-earned rest.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Dominion Chemist.

WHEAT AND BARLEY.

THE COMPOSITION OF THE GRAIN AS INFLUENCED BY THE SOIL MOISTURE-CONTENT.

This investigation, now in the sixth year of its progress, was continued during the past season on the Experimental Station at Lethbridge, Southern Alberta, growing wheat and barley under 'dry farming' conditions and under irrigation. In addition to the analysis of the parent seed and of the crop, determinations of the soil moisture-content of the several plots have been made at intervals throughout the season. It was expected from the data so obtained to find a relationship between the moisture-content of the soil during the vegetative period and the protein-content of the grain, for previous work had shown that the latter is always higher when development is hastened by a scanty supply of moisture and high temperatures than when ripening is retarded by ample moisture and cool weather.

Wheat.—The moisture-content of the irrigated and non-irrigated areas, as determined several times during the season, to a depth of fourteen inches, may be stated as follows:—

MOISTURE-CONTENT OF WHEAT PLOTS.

Date.	Irrigated. p.c.	Non-irrigated. p.c.
May 25, 1910	11·57	11·75
June 21, 1910	6·73	7·19
July 4, 1910	13·62	7·14
July 10, 1910	8·87	6·61
July 18, 1910	13·20	6·05
August 1, 1910	8·19	5·22

The plots used in this investigation, on the irrigated and non-irrigated areas alike, had been summer-fallowed in 1909, so that we might expect but slight differences, if any, in their moisture-content at the opening of the season, 1910. That such is the case will be seen from the data for May 25. A month later (June 21), the moisture-content on both areas, though considerably reduced, was still practically identical. Since the seed was sown on April 1, it is evident that the environment, in so far as soil-moisture is concerned, had been the same for the wheat on both areas during the major period of its growth. And, further, this period was an exceedingly dry one, certainly the driest since reliable meteorological observations have been recorded at Lethbridge.

Immediately after the collection of the second set of samples, the first irrigation was made (June 22), and the third series was not taken till a fortnight later (July 4), when the irrigated plots contained approximately twice the amount of moisture present in the non-irrigated area. The percentage of moisture in the latter was practically the same as on June 21. On July 10, the moisture was decidedly low on both areas, though there was a difference of 2 per cent in favour of the irrigated land.

The second irrigation was on July 13, and the fifth collection of samples was made five days later, July 18. We find moisture conditions very similar to those of July 4—a very low moisture-content in the soil of the non-irrigated area with approximately twice the amount in the irrigated soil. The sixth and last collection was on August 1, when the crop on both areas was harvested. Again, we find the soil very dry; in the non-irrigated land there was but 5·22 per cent, while in the irrigated area the soil only contained 8·19 per cent.

Our conclusions from these data may be summed up as follows: (1) That both plots started with practically the same moisture-content, a very fair but not exces-

sive amount. (2) That the non-irrigated area dried out continuously until the grain was harvested. The lowering of the moisture-content was more rapid, it will be seen, during the first examination period, May 25 to June 21, than during any subsequent similar period. In this connection we may infer, judging from results on the irrigated area, that the low moisture-content at the latter date had obtained for some time previous to this second examination. (3) That on the 'irrigated' area, until the first flooding (June 22), the soil was not more moist than that of the 'non-irrigated,' indeed it would seem to be somewhat the drier of the two; further, that the drying out of the irrigated plots after each flooding was very rapid, from which it is clear that the crops upon them were, for the most part, in a fairly dry soil and only intermittently enjoyed an abundant supply of moisture.

Two samples of Red Fife wheat were used for sowing these areas; the one grown on non-irrigated land, the other on irrigated. Both of these parent seeds had been obtained in this investigation at the Experimental Station, Lethbridge, Alta., the previous season, 1909.

WHEAT, 1910.

Expt.	Laboratory No.	Designation of Sample.	Weight of 1,000 Kernels.	Protein (N×5·7).
A	7793	Red Fife, parent seed, grown on irrigated land, 1909	36·6653	12·31
	8316	" grown on irrigated land, 1910	30·8576	16·53
	8318	" grown on non-irrigated land, 1910	25·8823	16·82
B...	7794	" parent seed, grown on non-irrigated land, 1909....	31·2698	16·13
	8315	" grown on irrigated land, 1910	30·2744	15·22
	8317	" grown on non-irrigated land, 1910	26·1502	17·16

Attention may first be directed to the great difference in protein-content, almost 4 per cent, between the two parent seeds, the crop of 1909; the higher—in accord with our previous work—being from the non-irrigated area.

In Experiment A, the crops from both irrigated and non-irrigated areas are practically identical in protein-content and very much higher than the parent seed which had been raised on irrigated land the previous season. That the wheat harvested from the non-irrigated area should be richer in protein than its parent was fully expected from our results of the past five years, but that the crop from the irrigated plot should be similarly high can only be explained on the ground that the moisture conditions of this plot during an important period in the life of the plant did not differ materially from those of the non-irrigated area. The data, indeed, seem to point to the conclusion that until the first irrigation, 83 days from seeding, the soil of the irrigated area was even drier than that of the non-irrigated.

In experiment B, wheat from non-irrigated land (1909) was employed, and as a consequence a high protein seed was sown. Its product on non-irrigated land was still richer in protein, a result in accord with our conjecture that the season was one of unusual dryness. The crop from the irrigated land was found to be about 1 per cent lower in protein than the parent seed. This is certainly not a large difference, but it is one in the direction expected from previous results. That it is not larger may be accounted for by the facts alluded to in discussing Experiment A.

Barley.—The foregoing experiments were repeated with barley, using seed from the crop of 1909, grown on irrigated and non-irrigated areas, respectively.

MOISTURE-CONTENT OF BARLEY PLOTS.

Date.	Irrigated.	Non-Irrigated.
	p. c.	p. c.
May 25, 1910	10·58	12·99
June 21, "	7·06	7·68
July 4, "	15·22	8·17
July 10, "	10·72	7·74
July 18, "	18·36	6·74
Aug. 1, "	8·19	6·47

Comparing the moisture-content of the two plots at the outset, the soil of the 'irrigated' area was decidedly the drier and this relationship obtained until the date of the first irrigation, June 22. After this date, the irrigated plots showed considerably more moisture than the non-irrigated, which steadily declined until the close of the season. It is of interest to note that the percentages of moisture for these irrigated barley plots were, subsequent to the first irrigation, higher than for the corresponding plots under wheat.

BARLEY, 1910.

Expt.	Laboratory No.	Designation of Sample.	Weight of 1000 Kernels.	Protein (N x 5·7)
A.	8323	Mensury, parent seed, grown on irrigated land, 1909.	39·0392	10·20
	8320	" grown on irrigated land, 1910.	33·6761	10·26
	8322	" grown on non-irrigated land, 1910	27·4728	14·59
B.	....	" parent seed, grown on non-irrigated land, 1909.	....	....
	8319	" grown on irrigated land, 1910.	33·9888	10·20
	8321	" grown on non-irrigated land, 1910.	28·6248	14·71

In Experiment A, the seed used had been grown on irrigated land in the year previous and was characterized by a low protein-content. The product on irrigated soil was found to be identical in nitrogen with its parent. It is clear that the conditions on these irrigated areas are distinctly favourable to the development of a low protein barley. It would further appear that these conditions must have been very similar during both seasons. Whether the lowest limit in nitrogen for this particular variety has been reached is not conclusively shown, but such is probably the case.

The product on non-irrigated soil is seen to be more than four per cent higher in protein than its parent, evidence that this cereal, like wheat, is readily influenced by soil moisture conditions.

Experiment B. The parent seed in this experiment had been grown at Lethbridge on non-irrigated land. Unfortunately, we are unable to present figures as to its protein-content, as the sample through some error or accident failed to reach the laboratory. The data from its progeny, however, tell the same tale as those in Experiment A, viz.: that the irrigated crop gave a low protein grain while that grown under 'dry

farming' conditions furnished a product very rich in protein. Indeed, it is significant that the results for the two irrigated plots are practically identical and similarly also for the barleys from the two non-irrigated areas.

Considered as a whole, these, our first results with barley, prove that the composition of this grain may be profoundly influenced by conditions of growth, probably to a greater degree than wheat, and that protein-content is by no means a matter entirely of heredity. In relation to barley, this investigation has a particular and important interest, since a low protein grain is highly prized for malting purposes.

INFLUENCE OF AGE ON WHEAT AND FLOUR.

In September, 1907, the Dominion Cerealist instituted a series of experiments to obtain, if possible, definite information respecting the influence of age (storage) on wheat and flour. Side by side with the milling and baking work, this Division undertook to trace chemically such changes in composition as might take place in the samples being studied. This was done in the hope that an explanation of a satisfactory character would be forthcoming for such improvement in strength as might be noted.

The series consisted of ten samples, comprising seven varieties of wheat. Three members of the series were stored as both wheat and flour, the remaining four being kept over as grain only. Those stored as grain were milled at the close of the periods determined upon, the resultant flours being analysed with those which had been put away at the beginning of the investigation. The analyses and the baking tests were conducted simultaneously.

The first storage period was from September, 1907, to January, 1909, and the results covering this time were given and discussed in the Report of the Experimental Farms for the latter year. The Cerealist found 'that when the material is kept over in the form of flour there is a more rapid improvement in colour and strength than when it is kept as wheat. The changes are not always regular, and a few exceptional cases were found. In every instance, however, there was a gain in water absorbing power, and as a rule this gain was considerable, amounting sometimes to more than four per cent after sixteen months of storage. There was also invariably an improvement in the shape of the loaf. In regard to volume of loaf, some irregularities occurred for which no satisfactory explanation can be offered at present.' The chemical data showed that during the sixteen months of storage in the larger number of instances the protein-content increased slightly in both wheat and flour, the increase being, as a rule, greater in the samples kept as flour. This increase, it was thought, was most probably due to a slow oxidation and consequent destruction of the carbohydrates. A tendency towards an increase in the gliadin was also observed as a result of storage. An improvement in the physical character of the gluten was also noted in two of the varieties that had been kept as wheat and which initially possessed gluten of inferior quality. Very possibly a more marked improvement would have been noticed had this sample been kept as flour.

The results of the past season have been interpolated in the following table, which presents the data from the series since the beginning of the investigation in a form easy of comparison.

The second storage period was from January, 1909, to January, 1911, and we may now inquire if the chemical work indicates any change in the wheat or flour during this time. Considering first those samples kept as flour, we do not observe any marked alteration in protein-content; in one case there is a slight decrease, in another the percentage is practically stationary, and in the third, there is a very small increase but the differences are such as might be ascribed to unavoidable error in sampling or analysis. In gliadin, the tendency to increase, noted for the first storage period, continues, so that the data for January, 1911, are percept-

INFLUENCE OF AGE ON THE QUALITY OF WHEAT AND FLOUR.

ANALYSIS OF FLOURS—RESULTS CALCULATED TO BASIS OF 8 P.C. MOISTURE-CONTENT.

Designation of Sample.	Date of Analysis and Baking.	Laboratory Number.	Milling Number.	Ash.	Protein (N x 5·7).	Gliadin (N x 5·7).	Percentage of Protein in the form of Gliadin.	Gluten. Wet.	Gluten. Dry.	Gluten. Ratio of Dry to Wet.	Gluten. Physical Characters. Resiliency.	Gluten. Physical Characters. Elasticity.	Gluten. Physical Characters. Colour.	Baking Strength. (Cerealist's marks.)
				p. c.	p. c.	p. c.		p. c.	p. c.					
Huron Selected, original	Sept. 1907	5143	152	·54	11·74	4·96	42·2	39·81	14·09	2·82	Good...	Good...	Yellow.	87
" kept as flour	Jan., 1909	6533	152	·50	12·23	5·57	45·5	39·60	14·23	2·78	" ...	" ...	Sl. yell..	100
" kept as wheat	" 1909	6532	231	·69	11·89	5·57	46·9	42·74	14·52	2·94	" ...	" .	" ..	84
" kept as flour	" 1911	8607	152	·55	11·78	5·69	48·3	37·98	13·74	2·76	" ..	" ...	" ..	109
" kept as wheat	" 1911	8608	358	72	12·19	5·55	45·5	40·37	13·98	2·88	" ...	" ...	" ..	99
Red Fife H., original	Sept., 1907	5146	155	·50	14·28	6·50	45·5	47·15	16·66	3·03	" ...	" ...	Good...	100
" kept as flour	Jan., 1909	6535	155	·49	14·54	6·66	45·8	44·58	16·03	2·78	" ...	" ...	" ...	108
" kept as wheat	" 1909	6534	232	·61	14·46	6·55	45·3	47·46	17·31	2·74	" ...	" ...	" ...	105
" kept as flour	" 1911	8609	155	·48	14·23	6·72	46·4	42·75	15·37	2·78	" ...	" ...	" ...	107
" kept as wheat	" 1911	8610	359	·72	14·58	6·53	44·8	49·38	16·96	2·91	" ...	" ...	" ...	106
Yellow Cross, original	Sept., 1907	5147	156	·57	13·09	5·61	42·9	41·99	15·32	2·87	" ...	" ...	" ...	75
" kept as flour	Jan. 1909	6539	156	·57	12·98	5·83	44·9	45·53	17·15	2·65	" ...	" ...	" ...	101
" kept as wheat	" 1909	6538	235	·66	13·10	5·72	43·6	46·75	16·93	2·76	" ...	" ...	" ...	87
" kept as flour	" 1911	8611	156	·59	13·17	5·91	44·8	42·58	16·02	2·65	" ...	" ...	" ...	112
" kept as wheat	" 1911	8612	362	·72	13·21	5·70	43·1	48·21	18·03	2·66	" ...	" ...	" ...	101
Stanley A, original	Sept., 1907	5144	153	·51	9·89	4·19	42·3	34·46	12·67	2·72	" ...	" ...	" ...	81
" kept as wheat	Jan., 1909	6537	234	·68	10·82	4·52	41·8	35·20	12·71	2·77	" ...	" ...	" ...	81
" kept as wheat	" 1911	8613	363	·69	10·71	4·37	40·8	34·70	12·94	2·68	" ...	" ...	" ..	101
Chelsea, original	Sept., 1907	5145	154	·51	10·51	4·71	44·8	33·96	12·49	2·72	Fair....	Fair....	" ...	86
" kept as wheat	Jan., 1909	6536	233	·68	12·11	4·93	40·7	32·47	12·99	2·50	Good...	Good...	" ...	90
" kept as wheat	" 1911	8614	364	·69	10·78	4·83	44·8	34·11	13·25	2·57	" ...	" ...	" ...	104
Dawson's Golden Chaff, original	Sept., 1907	5148	157	·46	11·13	5·06	45·4	38·35	14·11	2·72	Poor ...	Poor ...	" ...	70
" " kept as wheat	Jan., 1909	6531	229	·54	11·45	5·18	45·2	40·65	13·03	3·12	Fair....	Fair....	" ...	77
" " kept as wheat	" 1911	8615	366	·56	11·40	5·08	44·5	41·62	14·81	2·81	Poor ..	Poor ...	" ...	90
Turkey Red No. 380, original	Sept., 1907	5149	158	·49	10·41	4·54	43·6	34·81	11·53	3·02	Good...	Good...	" ...	95
" " kept as wheat	Jan., 1909	6530	228	·58	10·49	4·33	41·2	33·62	11·29	2·97	" ...	" ...	" ...	89
" " kept as wheat	" 1911	8616	365	·56	10·85	4·43	40·8	35·75	12·07	2·96	" ...	" ...	" ...	104

ibly higher than those of September, 1907. Similarly, there would appear to be an increase in the 'gliadin ratio' or percentage of protein in the form of gliadin. The gluten results are somewhat lower than they were two years ago, but the nature of this determination precludes the possibility of drawing conclusions from small differences.

Stored as wheat, five of the seven members of the series show very slight increases in protein, indicating that the tendency in this direction is more or less continuous for some years under the conditions of this investigation. In the larger number of cases the percentage of gliadin is exceedingly close to that obtained in 1909, and in no case perhaps is the difference greater than might be expected between duplicate analyses. The larger percentages of ash observable in the 1911 'kept as wheat' samples, when compared with the similar samples of 1909, evidently arise from slight differences in milling, a more complete removal of the bran elements being effected in the previous milling.

Nitrogen-and-ash-free Extract and Volume of Loaf.—The process used in the determination of nitrogen-and-ash-free extract is not one, perhaps, that permits of slight differences being recorded with accuracy, and we therefore hesitate to use the results given in the following table for the purpose of making fine distinctions. However, it may be safely concluded that they do not indicate a marked change in any one direction throughout the storage period 1907-1911.

A consideration of the results from the determinations of the nitrogen-and-ash-free extract and those from the volume of loaf does not indicate that there is any relationship between these data. The contention that volume of loaf increases with the amount of extract receives no support from this investigation.

NITROGEN-AND-ASH-FREE EXTRACT AND VOLUME OF LOAF.

Designation of Sample.	Date of Analysis and Baking.	Laboratory Number.	Milling Number.	Nitrogen-and-ash-free Extract.	Volume of Loaf. — (Cerealist's marks.)
Huron Selected—original	Sept., 1907	5143	152	3·39	433
" " kept as flour	Jan., 1909	6533	152	2·14	474
" " kept as wheat	" 1909	6532	231	4·45	395
" " kept as flour	" 1911	8607	152	3·25	524
" " kept as wheat	" 1911	8608	358	4·40	483
Red Fife H.—original	Sept., 1907	5146	155	3·19	534
" " kept as flour	Jan., 1909	6535	155	3·08	539
" " kept as wheat	" 1909	6534	232	3·65	539
" " kept as flour	" 1911	8609	155	3·14	521
" " kept as wheat	" 1911	8610	359	4·04	535
Yellow Cross—original	Sept., 1907	5147	156	4·28	402
" " kept as flour	Jan., 1909	6539	156	3·44	484
" " kept as wheat	" 1909	6538	235	2·62	421
" " kept as flour	" 1911	8611	156	3·95	548
" " kept as wheat	" 1911	8612	362	4·53	504
Stanley A.—original	Sept., 1907	5144	153	3·85	402
" kept as wheat	Jan., 1909	6537	234	5·21	366
" " "	" 1911	8613	363	4·61	468
Chelsea—original	Sept., 1907	5145	154	3·67	415
" kept as wheat	Jan., 1909	6536	233	4·58	420
" " "	" 1911	8614	364	4·43	491
Dawson's Golden Chaff—original	Sept., 1907	5148	157	3·26	374
" " kept as wheat	Jan. 1909	6531	229	3·43	392
" " " "	" 1911	8615	366	3·44	472
Turkey Red, No. 380—original	Sept., 1907	5149	158	4·08	485
" " kept as wheat	Jan., 1909	6530	228	4·39	407
" " " "	" 1911	8616	365	4·22	497

Ratio of Soluble Ash to Total Nitrogen and Shape of Loaf.—It is of interest to note in the first place that the chemical data given in the subjoined table reveal no differences or changes in those samples kept as flour. In two of the three, the results for any particular flour for 1907, 1909 and 1911 are practically identical, and in the third instance the figures for the first and last examination agree very well, indicating that the 1909 data for this sample, from some cause, are not correct.

RATIO TO TOTAL NITROGEN OF SOLUBLE CONSTITUENTS AND SHAPE OF LOAF.

Designation of Sample.	Date of Analysis and Baking.		Laboratory Number.	Milling Number.	Ratio to Total Nitrogen of Soluble.			Shape of Loaf (Cerealist's marks).
					Ash.	Alkali as K_2O.	Phosphoric Acid as P_2O_5.	
Huron Selected—original	Sept.,	1907	5143	152	6·0	20	16	·61
" kept as flour	Jan.,	1909	6533	152	7·0	20	16	·73
" kept as wheat	"	1909	6532	231	4·0	15	11	·67
" kept as flour	"	1911	8607	152	6·3	21	17	·74
" kept as wheat	"	1911	8608	358	4·1	12	15	·70
Red Fife H.—original	Sept.,	1907	5146	155	7·6	21	21	·63
" kept as flour	Jan.,	1909	6535	155	7·4	22	20	·73
" kept as wheat	"	1909	6534	232	6·0	19	15	·71
" kept as flour	"	1911	8609	155	7·7	21	19	·72
" kept as wheat	"	1911	8610	359	5·8	14	18	·71
Yellow Cross—original	Sept.,	1907	5147	156	6·4	16	17	·56
" kept as flour	Jan.,	1909	6539	156	4·9	14	11	·75
" kept as wheat	"	1909	6538	235	6·1	16	13	·70
" kept as flour	"	1911	8611	156	6·1	15	13	·77
" kept as wheat	"	1911	8612	362	5·1	13	13	·72
Stanley A.—original	Sept.,	1907	5144	153	5·0	15	15	·60
" kept as wheat	Jan.,	1909	6537	234	3·9	12	9	·68
" kept as wheat	"	1911	8613	363	3·8	10	8	·73
Chelsea—original	Sept.,	1907	5145	154	5·0	14	14	·65
" kept as wheat	Jan.,	1909	6536	233	4·7	14	11	·72
" kept as wheat	"	1911	8614	364	3·6	12	10	·73
Dawson's Golden Chaff—original	Sept.,	1907	5148	157	6·6	18	20	·56
" kept as wheat	Jan.,	1909	6531	229	7·0	17	16	·66
" kept as wheat	"	1911	8615	366	4·9	14	17	·71
Turkey Red, No. 380—original	Sept.,	1907	5149	158	5·9	17	17	·64
" kept as wheat	Jan.,	1909	6530	228	5·0	14	12	·71
" kept as wheat	"	1911	8616	365	5·7	15	15	·73

As witnessed in 1909, lower ratios were again obtained for the samples stored as wheat than as flour, in such as were kept in both conditions. These differences are probably attributable to milling, for, as already noticed, the ash in the flours milled in 1909 and 1911, is considerably higher than that in the corresponding flours milled in 1907. In those samples kept only as wheat, the agreement is fairly close.

Slightly higher marks for shape of loaf are accorded by the Cerealist, than at previous bakings, though in the larger number of cases the differences between the 1909 and the 1911 figures are slight.

As stated in our comments on the 1909 results, there is no evidence that there exists a relationship between the 'ratio of soluble ash to total nitrogen' and shape of loaf.

THE MOISTURE-CONTENT OF PACKED AND UNPACKED SOILS.

In our report last year we drew attention to certain results obtained at Lethbridge and Lacombe, Alta., relative to sub-surface packing as a means for conserving soil-moisture.* This work has been continued and we now present data from packed and unpacked areas under experiment last year at Lethbridge.

The land under examination was summer-fallowed in 1909, being ploughed in the early part of July. Part of it was immediately packed and the whole seeded in August with winter wheat. The samples for analysis were taken to a depth of fourteen inches, the first collection being made May 25, and the last on July 18, 1910, a few days previous to the harvesting of the wheat.

MOISTURE-CONTENT OF PACKED AND UNPACKED SOILS, LETHBRIDGE, ALTA.

Date.	Percentage of Moisture.	
	Packed.	Unpacked.
May 25, 1910	8·34	7·66
June 11, 1910	7·60	5·76
" 21, 1910	5·86	6·17
July 4, 1910	6·71	7·03
" 13, 1910	6·17	6·19
" 18, 1910	5·72	5·77

From the results of the two first sets of samples, we may, I think, conclude that the packed land starts the season with the more moisture, though the difference in its favour is not a large one.

From the third week in June until the date of harvesting, however, the moisture-content of the packed plot was either the same as, or lower than, that of the unpacked plot. The explanation for this may be in the larger moisture requirements of the crop on the packed area, for we may well suppose, other conditions begin equal, a more leafy development on the land which contained the more moisture during the earlier weeks of growth.

The results obtained in 1909 showed no very great advantage from the use of the subsurface packer, the determinations being made on plots under fallow and in crop. The conclusions from the trials of 1910, the plots carrying a crop of winter wheat, are much of the same character, though somewhat more favourable to the view that this operation is conducive to moisture conservation. As indicated in our previous article on this subject, the physical character of the soil determines in a measure the benefit derived from this operation, the lighter loams receiving the greater advantage.

* Report of Dominion Chemist 1910, pp. 214-5.

NITROGEN-ENRICHMENT OF SOILS THROUGH THE GROWTH OF CLOVER.

The importance of clover as a manurial agent led us to inaugurate in 1902 a number of experiments with the object of learning to what extent the nitrogen-content of a soil could be increased through the growing and turning under of this crop. Of these one plot has been constantly in clover since it was first seeded, the crop being cut as often as occasion required and the material allowed to decay on the soil. Every second year, the plot has been dug over and re-sown. At the outset it was dressed with superphosphate at the rate of 400 lbs., and muriate of potash at the rate of 200 lbs. per acre. The plot was limed at the rate of one ton to the acre in the spring of 1909.

From time to time, the soil of this plot has been sampled and its nitrogen-content determined. The following table presents the results to date:—

NITROGEN-ENRICHMENT OF SOIL DUE TO GROWTH OF CLOVER.

—	Date of Collection.	Nitrogen.	
		Percentage in Water-free Soil.	Pounds per Acre to Depth of 4 Inches.
Before experiment	13 5-02	·0437	533
After two years	14-5-04	·0580	708
After four years	15 5-06	·0608	742
After five years	30-5-07	·0689	841
After six years	23-5-08	·0744	908
After seven years	4 5-09	·0750	915
After nine years	5-5-11	·0824	1,005
Increase in nitrogen due to nine years' growth		·0387	472

This soil, it will be observed, continues to increase in nitrogen, though the figures afford evidence of a falling in the rate of increase as the experiment progresses. It is equally evident, however, that the limit of enrichment has not yet been reached.

The total nitrogen of the soil has practically doubled in the nine years of the experiment; averaging the results there has been an annual increase of 52·4 lbs. per acre.

INOCULATION EXPERIMENTS WITH NITRAGIN FOR LEGUMES.

As reported last year, trials were begun on the Central Farm in the spring of 1909, with Hiltner's Nitragin, as prepared by the Dr. Reiche Nitragin Company, of Milwaukee, Wis., U.S.A. Cultures for Red Clover, Alfalfa and Peas were used, and the methods of soil and seed inoculation employed.

The 1909 results, viewed generally, showed no marked advantage from the use of the cultures. The soil used in these experiments was extremely poor and sandy, and had not carried a leguminous crop for at least nine years, yet we found the roots of the plants in the uninoculated soil well supplied with nodules—a fact that serves to confirm our deductions, previously made, that the nitrogen-assimilating bacteria are widely disseminated in the soils of cultivated districts. It further may furnish the reason for the apparent inefficiency of the cultures.

The plots in clover and alfalfa were those of the previous year, and consequently have afforded data for the second year's growth of these crops. Each series comprised three plots: 'uninoculated,' 'seed inoculated,' and 'soil inoculated.'

Red Clover.—There was a good 'stand' on all three plots at the opening of the season. Later, for some reason that was not apparent, the crop of the 'soil-inoculated' plot was not so vigorous as on the other two.

CLOVER, 2ND YEAR CROP.

Dates of Cutting.	Uninoculated.				Seed Inoculated.				Soil Inoculated.			
	Fresh.		Air-dried.		Fresh.		Air-dried.		Fresh.		Air-dried.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
First cutting, June 15	67	14	9	14	68	..	9	..	50	1	8	2
Second " July 18	10	6	1	10	15	11	2	8	7	14	1	4
Third " Aug. 29	19	0	4	5	16	1	3	10	10	6	2	8
	97	4	15	13	99	12	15	2	68	5	11	14

At the time of the first cutting (June 15), all three plots might be said to be in full bloom, and all equally advanced. The yields on the 'uninoculated' and 'seed inoculated' plots, weighed both green and as hay, were very close, and considerably higher than that on the soil-inoculated area.

On July 18, the cutting on the 'seed-inoculated' plot was the heaviest, the yield from the 'soil-inoculated' still remaining the lightest. At the third cutting, August 29 the position of the two former plots as regards yields was reversed, the 'uninoculated' crop being, weighed green, three pounds heavier.

Considering totals, we have results in accord with those of the first cutting, viz., no differences of importance (or, at least, from which it would be safe to make deductions) between the yields of the 'uninoculated' and 'seed-inoculated' areas, with a decidedly lower yield from the 'soil-inoculated' plot.

Alfalfa.—The crop made a very good start on all three plots, and was exceedingly healthy and vigorous throughout the season. Notes made at the times of cutting state that while excellent crops were cut on every plot, that on the 'uninoculated' was, throughout the season, from appearances, the heaviest.

ALFALFA, 2ND YEAR CROP.

Dates of Cutting.	Uninoculated.				Seed Inoculated.				Soil Inoculated.			
	Fresh.		Air-dried.		Fresh.		Air-dried.		Fresh.		Air-dried.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
First cutting, June 15.....	49	13	10	9	38	6	8	12	49	11	10	12
Second " July 18.....	33	..	6	4	30	4	5	15	30	7	5	12
Third " Aug. 29.....	40	9	12	4	37	0	11	4	38	1	11	7
	123	6	29	1	105	10	25	15	118	3	27	15

On June 15, when the plots were first cut, the plants were just coming into bloom and the yield, from appearances. somewhat lighter on the 'seed inoculated' than on either of the other two plots. The weights bear out the impression from an inspection of the series: those for the crops, both green and as hay, for the 'uninoculated' and 'soil inoculated' were practically identical, with that from the 'seed-inoculated' decidedly lighter.

The crop was an excellent one and in full bloom on all three plots at the time of the second cutting. The yields were very close, with a slight margin in favour of the 'uninoculated' plot.

When cut the third time, August 29, about three-fourths of the crop was in bloom and an excellent growth on all three plots. Again, the results are slightly in favour of the 'uninoculated' area.

The totals show that the heaviest yield was obtained from the 'uninoculated' plot the lightest from the 'seed inoculated' that from the 'soil inoculated' area occupying a position midway between them.

So far as the present experiment is concerned, there are no indications of material advantage from inoculation. Trials with various cultures made by us here and elsewhere in the Dominion during the past twenty years have all pointed towards inoculation being generally unnecessary when the soil is under a rotation, in a good state of cultivation and well drained. Many instances of benefit arising from inoculation are known to the writer, but very few of them have occurred in the older and best-farmed districts. The larger number of the most striking cases, where a response has followed inoculation, have been in the Northwestern provinces, upon newly broken land, and it seems quite probable that such soils are but poorly supplied with the particular organisms capable of assisting the farm legumes. Cases of improvement following inoculation have also been reported from the maritime provinces, generally from areas covered with soils poor in humus and upon which no rational rotation has been followed. Failure to obtain a catch of clover or other legume does not necessarily imply the absence of nitrogen-assimilating bacteria; it is perhaps more often due to deficiency of moisture, an unsuitable seed bed, an acid condition of the soil or to a lack of proper drainage. Seed of a low germinative value has also been found answerable for an imperfect catch. Before concluding that inoculation is necessary, it would therefore be the part of wisdom to inquire whether the lack of success may not be due to one or more of these unfavourable conditions, or to poor seed.

Where inoculation is thought to be necessary or desirable, we believe that soil from the surface of a field that is growing the legume (clover or alfalfa, as the case may be), will be found more effective than 'cultures.' According to the reports we have received, this method has almost invariably proved more successful than the use of the purchased preparations. The soil should be broadcasted, as soon as may

be possible after its collection, on the thoroughly prepared land to be sown and immediately harrowed. The application may be at the rate of 100 to 300 lbs. per acre, and the operation is the more likely to be successful if carried out on a cool, damp, cloudy day.

THE RELATIVE VALUE OF FIELD ROOTS.

In this investigation, analysis is made season by season of the mangels, turnips and carrots, as grown on the Central Experimental Farm, Ottawa. This work has been carried on with the view of obtaining data respecting the relative feeding value of the leading varieties of field roots and of ascertaining the differences in composition that might result from varying seasonal conditions. This work has been carried on since 1903.

MANGELS.

The eight varieties grown in 1910, have been cropped here for a number of years past and are all well-known mangels. In the following table they are arranged according to their richness in dry matter. The percentage of sugar, which as a rule, but not invariably, follows the dry matter-content, and the average weight of root, are also given.

ANALYSIS OF MANGELS, C. E. F., OTTAWA, ONT., 1910.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lbs.	Oz.
Giant Yellow Intermediate	88·43	11·57	5·38	5	3
Prize Mammoth Long Red	88·50	11·50	5·84	4	8
Yellow Intermediate	89·04	10·96	5·59	5	2
Perfection Mammoth Long Red	89·21	10·79	5·14	5	14
Half Sugar White	89·90	10·10	3·95	5	4
Gate Post	90·41	9·59	4·26	6	8
Selected Yellow Globe	92·01	7·99	2·79	6	0
Giant Yellow Globe	92·20	7·80	2·74	6	13

Between the first and the last, the richest and the poorest of this series, considerable differences are to be noted. Thus, in dry matter we find a difference of 3·77 per cent, and in sugar of 2·64 per cent, from which we may conclude that the poorest variety is approximately one-third less nutritive than the richest. In so far as the nutrients are concerned, this means that one ton of the latter is equivalent to about 3,000 lbs. of the former.

Averages from the results of the past seasons are given in the following table:—

MANGELS—Yield and Average Composition, 1904-1910.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lbs.	Oz.	Tons.	Lbs.	p. c.	p. c.
1904	10	2	11	30	1,277	11·69	6·62
1905	17	3	9	39	369	10·04	4·67
1906	16	2	7	31	1,569	11·63	5·93
1907	10	2	11	27	680	12·64	7·46
1908	12	2	2	23	690	11·87	5·33
1909	14	3	5	28	920	11·21	6·21
1910	8	5	10	56	57	10·04	4·46
Average for 7 years, 1904-10						11·30	5·81

It will be seen that in dry matter and sugar the mangels of 1910 fall considerably behind those of former years. In all probability this is to be attributed to the large size of last season's roots, the average weight being 5 lbs. 10 ounces, as compared with weights generally somewhat less than 3 lbs in previous years. The character of the season has naturally a great influence on the size of the root and the latter, as is well known, is an important factor in determining composition—the larger the root, other things being equal, the poorer its quality. The relation between weight of root and yield per acre is a fairly constant one when comparing crops under the same cultural treatment, a very large root will mean a heavy crop. In consequence we find a lower feeding value, weight for weight, when the yield is extraordinarily large than when the crop is a medium one.

INFLUENCE OF HEREDITY IN MANGELS.

For eleven seasons we have analysed the Gate Post and the Giant Yellow Globe, varieties representing two distinct types of mangels. The roots submitted to analysis have always been grown side by side so that as far as soil, seasonal and cultural conditions were concerned, the environment has been practically identical for both varieties. If characteristics of composition can be transmitted; if, in other words, heredity is a factor influencing the percentage of dry matter and the sugar content, evidence thereof should be forthcoming from the results of this investigation. The data are presented in the following tabular scheme:—

DRY MATTER AND SUGAR IN GATE POST AND GIANT YELLOW GLOBE MANGELS.

Season of Growth.	Gate Post.				Giant Yellow Globe.			
	Average Weight of One Root.		Dry Matter.	Sugar in Juice.	Average Weight of One Root.		Dry Matter.	Sugar in Juice.
	Lbs.	Oz.	p. c.	p. c.	Lbs.	Oz.	p. c.	p. c.
1900			11·14	6·15			8·19	2·64
1901	2	9	9 41	4·15	3	3	9 10	4·08
1902	3	2	13·90	9·39	3	9	10·24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1905	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12 73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
1908	1	11	12 02	4·94	2	4	10·66	4·47
1909	3	14	11 82	6·64	3	7	10·95	5·82
1910	6	8	9·59	4·26	6	13	7·80	2·74
Average for 11 years			11·90	6·47			9·93	4·79

The Gate Post, it will be observed, has invariably proved the superior root; seasonal conditions and size of root have from year to year caused considerable fluctuations in composition, but the relative position of the two varieties under examination has always remained unchanged. This fact points unmistakably to the conclusion that the composition of a root is in a large measure controlled by hereditary influences, and lends weight to the view that improvement in field roots, as regards feeding value, might be brought about by well directed breeding experiments.

TURNIPS.

Ten varieties have been examined. The differences in composition are not so pronounced as in mangels, but are nevertheless sufficiently large to warrant the conclusion that all varieties are not of equal feeding value. In this series, one ton of the richest is equivalent in dry matter to 2,308 lbs. of the poorest.

ANALYSIS OF TURNIPS, C.E.F., OTTAWA, ONT., 1910

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lbs.	Oz.
Perfection Swede	88·18	11·82	1·42	4	5
Halewood's Bronze Top	88·73	11·27	1·32	3	15
Hartley's Bronze	88·88	11·12	1·22	3	13
Good Luck	88·97	11·03	1·00	2	1
Hall's Westbury	89·02	10·98	0·90	2	15
Carter's Elephant	89·27	10·73	1·13	3	13
Jumbo	89·34	10·66	1·01	2	15
Magnum Bonum	89·49	10·51	0·51	3	12
Mammoth Clyde	89·64	10·36	1·33	5	8
Bangholm Selected	89·76	10·24	0·91	3	15

The roots of the past season were larger than usual and this, no doubt, furnishes the explanation for the somewhat low percentages of dry matter and sugar recorded in the foregoing table.

The averages for the past six years' work with this root are as follows:—

TURNIPS—Average Composition, 1905-1910.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lbs.	Oz.	Tons.	Lbs.	p. c.	p. c.
1905	20	2	13	30	1,060	10·09	1·10
1906	20	1	10	15	1,890	12·18	1·78
1907	14	3	5	33	142	10·14	1·11
1908	13	3	12	27	1,033	9·87	1·52
1909	13	2	10	29	512	11·30	1·43
1910	10	3	11	31	565	10·87	1·07
Average for 6 years, 1905-10	......	......		......		10·78	1·33

Though probably no direct relationship exists between size of root and composition, these data indicate clearly that the smaller roots are the richer; almost invariably increase in size is accompanied by decrease in dry matter content, when individual roots of the same variety are compared, and, in a large degree, this observation also holds true when comparing averages from a number of varieties, from crops of different seasons.

CARROTS.

The five varieties examined and here reported on are among those which have been grown and analysed for a number of years past.

ANALYSIS of Carrots, C.E.F., Ottawa, Ont., 1910.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p.c.	p.c.	p.c.	Lbs.	Oz.
Ontario Champion	89·04	10·96	5·92	1	3
Half Long Chantenay	89·64	10·36	3·44	2	1
Improved Short White	89·85	10·15	2·33	1	3
Mammoth White Intermediate	89·97	10·03	3·25	2	1
White Belgian	90·62	9·38	1·22	1	3

While the differences in dry matter content, throughout the series, are not large, considerable variations in sugar—the chief nutrient—may be observed. It would appear from this, as from previous work, that there is not the same close relationship between dry matter and sugar in carrots as is found in other farm roots.

The average results for the past six years are appended.

CARROTS—Average Composition, 1905-1910.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Yield per Acre.		Dry Matter.	Sugar.
		Lbs.	Oz.	Tons.	Lbs.	p. c.	p. c.
1905	11	1	3	25	1,510	10·25	2·52
1906	10	1	2	19	1,605	10·59	3·36
1907	6	1	1	24	1,517	10·30	3·02
1908	6	1	3	22	133	10·89	3·34
1909	6	1	0	17	1,680	10·40	2·30
1910	5	1	9	34	1,640	10·17	3·23
Average for 6 years, 1905-10						10·43	2·96

It is interesting to note, comparing the results from the commencement of the investigation, that the annual averages for dry matter and sugar—and more especially for the former—are so close.

SUGAR BEETS FOR FACTORY PURPOSES.

The three leading varieties of sugar beets—Vilmorin's Improved, Klein Wanzleben and Très Riche—have, in accordance with our custom for many years past, been grown on the several Experimental Farms and Stations. The sugar-content, co-efficient of purity and other data, obtained from the roots grown during the past season, are tabulated as follows:—

SUGAR BEETS grown on the Dominion Experimental Farms, 1910.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of One root.		Yield per Acre.	
				p.c.	Lbs	Oz.	Tons.	Lbs.
Vilmorin's Improved	Charlottetown, P.E.I...	14·54	17·88	81·3	2	14	14	809
	Nappan, N.S...........	18·24	20·49	89·0	1	1	11	1,760
	Ottawa, Ont........ ...	18·72	21·49	87·1	1	5	23	500
	Brandon, Man..........	19·23	21·89	87·8	1	11	12	552
	Lacombe, Alta.	13·40	17·37	77·1	1	11	6	1,728
	Agassiz, B.C...........	19·92	21·37	93·2	0	13	13	400
Klein Wanzleben...	Charlottetown, P.E.I...	13·96	16·83	82·9	1	9	14	1,832
	Nappan, N.S...........	16·13	18·43	87·5	0	13	10	1,625
	Ottawa, Ont...........	16·43	19·40	84·7	1	5	24	100
	Brandon, Man..........	18·87	22·09	85·4	1	9	13	1,192
	Lacombe, Alta.	12 94	16·63	77·8	1	11	5	1,220
	Agassiz, B.C.	20·08	22·03	91·1	0	14	11	440
Très Riche..........	Charlottetown, P.E.I...	14·26	17·26	82·6	2	6	18	1,372
	Nappan, N.S.	14·92	17·40	85·8	1	1	13	1,225
	Ottawa, Ont...........	14·18	16·80	84·4	2	2	28	800
	Brandon, Man..........	17·11	22·19	77·1	1	3	8	1,424
	Lacombe, Alta.	11·73	15·40	76·1	1	12	6	1,728
	Agassiz, B.C..........	17·55	19·11	91·8	0	14	9	1,965

With the exception of the beets grown at Lacombe, Alta., the roots generally have given very satisfactory results. Considering sugar-content and purity, those from Agassiz, B.C., stand at the head of the series, closely followed by the beets grown at Brandon, Man., Nappan, N.S., and Ottawa, Ont. No doubt the small size of the root recorded for Agassiz—less than a pound—may account in some measure for the very superior quality of the beets from that Farm.

Again climatic conditions at Lacombe (Northern Alberta) have been unfavourable to good returns. This is the fourth season of the investigation at this Experimental Station, and so far the results—both as to quality and yield—have not indicated the locality to be one suitable for the profitable culture of this crop.

By an unfortunate oversight, beets for analysis were not received from Indian Head, Sask., and Lethbridge, Alta.

Averages from the three varieties for the past nine years are presented in the following table:—

AVERAGE Percentage of Sugar in Juice in Sugar Beets grown on Experimental Farms, 1902-1910.

Locality.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.
Charlottetown, P.E.I.	......	......	......	......	......	......	......	......	14·25
Nappan, N.S.	15·87	15·33	14·41	16·52	17·08	......	17·53	16·74	16·43
Ottawa, Ont.	16·77	15·34	16·91	12·45	14·37	15·44	16·30	14·84	16·44
Brandon, Man.	......	11·36	16·62	11·09	15·50	16·99	15·82	18·83	18·40
Indian Head, Sask.	15·15	16·54	15·24	14·94	14·91	15·92	15·66	17·16	......
Lethbridge, Alta., irrigated	......	......	......	......	......	......	16·09	17·91	......
" " non-irrigated	......	......	......	......	......	......	16·73	18·36	......
Lacombe, Alta.	......	......	......	......	......	13·34	11·21	12·77	12·69
Agassiz, B.C.	......	17·44	8·10	17·32	14·23	17·65	17·15	18·30	19·18

The results do not differ materially from those of 1909. They clearly indicate that beets of superior quality for factory purposes may be grown at widely distant points in the Dominion.

FODDERS AND FEEDING STUFFS.

The official examination of Feeding Stuffs being now under the direction of the Inland Revenue Department, this laboratory has been relieved from the necessity of analysing samples of this character, generally, though analyses are still made in connection with our own feeding experiments or to obtain data of general interest. In the subjoined figures, the results are given of a few brands of oil cake and cotton seed cake that it has been found desirable during the past year to submit to examination.

COMPOSITION OF OIL CAKE AND COTTON SEED MEAL.

Laboratory No.	Name.	Particulars.	Moisture.	Crude Protein.	Fat or Oil.	Carbohydrates.	Fibre.	Ash.
			p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
8015	Oil Cake	Sherwin-Williams Paint Co.	8·85	34·06	8·73	....	....	5·13
8016	"	Dominion Linseed Oil Co.	8·59	36·19	11·93	....	......	5·22
8658	" meal	" "	....	31·31	7·62	....	......	......
8681	Linseed meal	Sherwin-Williams Paint Co.	....	37·75	8·47	....	......	......
7749	Cotton Seed meal.	R. Cummings	....	39·06	7·23	....	......	......
8465	" "	Dominion Feed Co.	6·89	37·31	6·73	29·80	13·13	6·14
8603	" "	Dixie Brand, Humphreys, Godwin Co., Memphis, Tenn.	....	37·81	7·39	....	......	......
8335	" "	Humphreys, Godwin & Co., Memphis, Tenn	6·44	39·88	8·74	....	9·57	......
8836	" "	The American Cotton Oil Co., St. Louis, Mo.	6·59	39·00	7·71	....	8·76	......
8874	" "	Bartlett Co., Detroit.	7·60	40·81	7·3[illegible]	....	8·63	......
8875	" " cake	H. S. Conn, Ottawa	9·13	19·94	9·28	....	23·95	......
8938	" "	" "	10·96	21·02	10·60	....	23·47	......

The oil cakes and oil cake meals have always been found genuine and of good quality, though, as might be expected, differences in protein and oil-content have been noticed. The present samples, while all genuine, similarly exhibit differences in

nutritive value, making it highly desirable to purchase on guaranteed analysis as to protein and oil-content. From the results tabulated, it will be observed the range in protein is from 31·3 to 37·7 per cent, and in oil from 8·4 to 11·9 per cent.

Considerable care and scrutiny should be exercised in purchasing cotton seed cakes and cotton seed meals, since great variations in composition exist among the many brands on the market, not a few of which have been found of very inferior quality. These inferior grades are characterized by the presence of excessive amounts of hull discernible as dark, coarse, hard fragments, or by containing cotton fibre, very easily detected from the woolly appearance of the meal or of the cake when freshly broken. Much hull or husk is most undesirable, as it means a meal not only low in protein and oil but one of impaired digestibility and possessing marked astringency. Good cake or meal from thoroughly decorticated (hulled) seed should not contain more than seven per cent of fibre, with a protein-content of about 40 per cent and 8 to 10 per cent of oil. A few years ago, 15 per cent of oil was not uncommon. Undecorticated cake, made from the unhulled seed, may not contain more than 25 per cent protein and perhaps 5 per cent of oil, with an excessive amount, 20 to 30 per cent, of fibre.

The presence of cotton fibre arises from imperfect 'ginning' the fine downy layer immediately covering the seed being somewhat difficult to remove. It is a most objectionable feature, not merely in lowering the amounts of the important nutrients present but rendering the meal undesirable generally, and quite unsuitable as a feeding material for young stock.

Of the samples recently examined the greater number are of very fair quality, though the data make it evident that a guarantee as to protein, oil and fibre is necessary even when purchasing meal or cake of high grade. Thus, for example, comparing Nos. 8465 and 8836, the former possesses but 1·7 per cent protein and 1 per cent oil less than the latter. We notice, however, a very decided difference in fibre which most markedly emphasizes the superior feeding value of the latter sample.

Samples of undecorticated meals, Nos. 8875 and 8939 are distinctly inferior grades. Their protein-content is practically but half that in good brands, and their fibre is excessively high, due to the presence of both hulls and cotton. Though careful inspection would have revealed their inferior character, it would have been impossible to classify or rank properly such samples without the analytical data and hence we again urge purchasers to insist on a certified or guaranteed analysis, carefully comparing the figures of competing brands with the standards here outlined. A very considerable saving may frequently be effected, not necessarily by buying the cheapest brand in the market, but one presenting the greatest food value for the money. It is the analysis that furnishes the very best basis for comparison, and in this case we must not only look for high protein and oil but also see that the fibre-content is not excessive, remembering that a high percentage not merely lowers the content of the more valuable nutrients, but at the same time depresses their nutritive value.

Burnet—*(Poterium Canadense)*.

This forage plant has been used in Newfoundland as sheep pasturage, for which according to our correspondent, Mr. Chas. Dodd, The Log Cabin, Nfld., it has a good reputation. He writes 'this plant forms the bulk of my sheep pasture and I should be glad to know its true feeding value. I believe it is the plant that causes our cariboo to fatton so quickly. It gives a big crop from the middle or end of May till late in the autumn.'

As received, the sample consisted of stems with leaves attached, quite green, fresh and succulent. The plants had been cut close to the ground and were about 18 inches in length. When air-dried they were found to be brittle, but not tough, and apparently not unusually fibrous. Our analysis afforded the following data:—

ANALYSIS OF POTERIUM CANADENSE.

Constituents.	Sample as Received.	Results calculated to Water-free Basis.
	p.c.	p.c.
Water	80·24	....
Protein	3·87	19·62
Fat or oil	·24	1·20
Carbohydrates	4·11	20·80
Fibre	9·75	49·34
Ash	1·79	9·04
	100·00	100·00

Judged from the standpoint of composition, this plant compares favourably with many forage grasses of recognized value. Cut at the stage of growth represented by this sample—well grown but not in flower (cut May 22)—its hay would contain about 16 per cent protein, which must be considered very satisfactory.

The feature to which objection might be urged is the somewhat high fibre-content. This constituent would increase not only in amount but in indigestibility as the season advances, and therefore early cutting is to be advised, when the crop is intended either for the silo or to be made into hay. Besides this deterioration in food value, there would no doubt be also a falling off in palatability.

In response to our request for information regarding experience with this fodder in the United States, Dr. A. C. True, Director, Office of Experiment Stations, Washington, D.C., writes: 'The presumption is the *Poterium canadense* has considerable nutritive value, but we do not recall any experiments which have been made to determine its true value as a feedstuff, and we do not know of any one who can give you the information desired.'

'*Poterium canadense* differs but little from *P. sanguisorba,* the common Burnet. The latter at one time had quite a reputation for sheep pasturage, but it is now considered inferior to sainfoin.'

FERTILIZING MATERIALS.

'NATURAL FERTILIZER.'

Under this name we received, during the early summer months of 1910, several samples, both in the ground and unground condition, of a rock held to possess distinct value as a fertilizer. Though our correspondents lived in various parts of the maritime provinces, it was evident that all the samples were originally from a deposit or deposits in the neighbourhood of Dunvegan, Inverness county, Nova Scotia. Sales of it, in the finely ground condition, were reported in many districts in Nova Scotia, and a considerable quantity had been disposed of for fertilizer purposes in Prince Edward Island. The prices quoted varied from $4 to $14 per ton—the price, presumably, being largely influenced by the freight charges. As in certain localities this material was receiving wide advertisement and the reports concerning its practical value were conflicting, it was thought desirable to submit it to analysis and publish the data for the benefit of maritime farmers.

The rock as quarried is a dark gray, laminated shale, showing many small fossils; it is fairly soft, and may be readily reduced to a powder. The analytical data from the examination of three samples of this material are as follows:—

COMPOSITION OF 'NATURAL FERTILIZER.'

Constituents.	A.	B.	C.
	p. c.	p. c	p. c.
Organic and volatile matter	12·55	12·01	13·48
Mineral matter insoluble in acid	43·28	54·53	59·69
Oxide of Iron and Alumina	9·50	12·69	12·87
Carbonate of Lime	30·23	19·56	14·00
Sulphate of Lime	2·94	....	....
Phosphate of Lime	·77	·68	·80
Carbonate of magnesia	·82	·28	?
Undetermined	....	·25	....
	100.09	100·00	100 84
Phosphoric Acid	·35	·32	·37
Nitrogen, in organic matter	·18	·16	·13

This rock contains, it will be seen, considerable, though somewhat variable, amounts of carbonate of lime and organic matter. The amounts of phosphoric acid and nitrogen do not exceed those in many soils, and as regards availability are certainly not more valuable. Potash is absent, or practically so. It is evident, therefore, that this material is not in any sense comparable to commercial fertilizers, which are characterized by notable percentages of nitrogen, phosphoric acid and potash, more or less immediately available for plant growth.

Though not a fertilizer in the ordinary acceptation of the word, this rock in the finely ground condition might act as an 'amendment' for certain classes of soils.

The benefit from its use would be due chiefly to the carbonate of lime it contains, and to some extent possibly to the influence it would exert on the physical condition or texture of the soil. It might, for these reasons, be expected to improve peaty and muck soils, heavy clay loams, those which are sour, ill-drained and all those naturally deficient in lime. These benefits are, of course, those which might be expected from any ordinary limestone applied in a fine condition.

LIMESTONES.

Attention has been directed in recent years to the agricultural value of finely-ground limestone, not merely to furnish lime when the soil is deficient in this element. but to correct sourness, promote nitrification and improve tilth. While we have as yet very little direct testimony in Canada on the use of ground limestone, we may safely predict a favourable response when applied to such soils as we enumerated when speaking of the use of the so-called 'Natural Fertilizer,' quarried and ground in Nova Scotia. It must not, however, be supposed to act as a panacea for all soil troubles, nor can its use alone be expected, even when a good rotation is followed, to maintain fertility. It does not supply humus-forming material (so necessary for the conservation of moisture and the 'life' of the soil) as do the farm manures, nor does it contain the more important elements necessary for plant growth—nitrogen, phosphoric acid and potash—as do both manures and fertilizers. It cannot, therefore, be regarded in any sense as a substitute for these, nor as we have pointed out, can it be regarded as a newly discovered material that can solve satisfactorily all soil problems. Experience throughout the known agricultural world has made very clear the high fertility of soils naturally rich in lime and the excellent character of the crops and of the stock raised thereon. It has also taught us concerning the use and abuse of lime; how it may be used occasionally to advantage, but also how its exclusive and

continued employment has worked disaster. From history, therefore, we can learn something as to the part that ground limestone may play in economic agriculture. We have no doubt it will in time find a place in Canadian farming and prove of great value to those whose soils are, from the chemical or physical standpoint, in need of lime; but to those who would place sole reliance upon it as a means of increasing and maintaining soil fertility, we do not hesitate to say that the end will be disappointment and loss.

Inquiries are also received from time to time as to the qualities of certain limestones to be used in the preparation of Lime-sulphur wash, the purity of the lime employed in this manufacture being a matter of considerable importance.

To furnish information as to the suitability of certain limestones for the purposes we have discussed, analyses of several samples have been made, the data of which are as follows:—

Composition of Limestones from New Brunswick.

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Rock matter, insoluble in acid	·05	·21	3·03	1·74	3·02	2·68
Oxide of Iron and Alumina	·13	·34	1·23	1·06	1·03	0·31
Carbonate of Lime	99·59	99 77	96·41	95·88	96·50	97·13
Carbonate of Magnesia	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.
	99·77	100·32	100 67	98·68	100·55	100·1

No. 1—From quarry of P. & G., St. John, N.B.
2— " S. C. & Co., St. John, N.B.
3— " R. B. & Co., St. John, N.B.
4— " C. M., St. John, N.B.
5— " L. R., Brookfield Station, N.B.
6— " L. R., Brookfield Station, N.B.

No very marked difference exist among these limestones, and all may be considered of good quality. The practical freedom from magnesia indicates their suitability for the manufacture of lime to be used in the preparation of the Lime-sulphur wash. The value of these analyses lies chiefly in the fact that the samples examined were all taken from quarries about St. John, N.B., which, it is stated, supply all the lime used in New Brunswick and a considerable part of Nova Scotia.

A sample from Grand Forks, B.C., afforded the following data:—

Carbonate of lime	94·32	per cent.
Carbonate of magnesia	·12	"
Oxide of iron and alumina	·76	"
Mineral matter insoluble in acid	4·90	"
	100·10	"

This is evidently a good quality limestone and one suitable for all agricultural purposes.

A sample sent from Victoria, B.C., had the following composition:—

Carbonate of lime	80·47	per cent.
Oxide of iron and alumina	·70	"
Mineral matter insoluble in acid	18·51	"
Undetermined (by difference)	·32	"
	100·00	"

The somewhat large amount of insoluble rock matter present renders this a limestone of fair quality only.

LIME.

The following data were obtained on a sample of lime being used in Wolfville, N.S., in the manufacture of Lime-sulphur wash:—

Lime (CaO)	96·50	per cent.
Magnesia (MgO)	very slight traces	
Mineral matter insoluble in acid	·91	"

This lime had slightly carbonated, due to exposure to the air, but may be considered a good sample and one quite suitable for the purpose specified.

REFUSE LIME FROM BEET SUGAR FACTORY.

This sample of waste lime, used in the purification of sugar, was forwarded from Wallaceburg, Ont. It was found to have the following composition:—

Moisture	3·32	per cent.
Carbonate of lime	82·32	"
Oxide of iron, magnesia (by difference)	1·58	"
Mineral matter insoluble in acid	——	
Organic and volatile matter	12·78	"
	100·00	"
Nitrogen	·35	"

Practically, this refuse is carbonate of lime with some 12 per cent of organic matter extracted from the beet juice in the purification process. It would prove of value for all soils deficient in lime, as well as for those that are sour and ill-drained. It contains a small amount of nitrogen, which would be of some agricultural value, but for practical purposes this refuse could only be considered as an amendment equal in merit to marl of good quality.

MARL.

During the year several samples of this naturally-occurring amendment have been analysed

Analysis of Marls.

Constituents.	No. 1.	No. 2.	No. 3.	No. 4.
	p. c.	p. c.	p. c.	p. c.
Moisture	....	·60	5·08	....
Carbonate of Lime	34·4	88·87	79 30	88·75
" Magnesia	....	·75	·33	....
Oxide of Iron and Alumina	3 6	1·50	·79	....
Clay, sand, etc	58·2	3·62	3·28	1·50
Organic matter, etc., (by difference)	3·8	4·66	11·22	....
	100·00	100·00	100 00	....
Nitrogen	....	·324	·47	
Phosphoric Acid	....	trace.	trace.	

No. 1.—A deposit from Mabou Harbour Mouth, N.S., containing about one-third of its weight of carbonate of lime. Though of somewhat poor quality, it is likely to prove of value for soils needing lime.

Nos. 2 and 3 are shell marls of excellent quality, from the neighbourhood of New Richmond, Quebec.

No. 4.—A very good shell marl from S. R., Grey county, Ontario.

Marl is an amendment of considerable value for all soils that would be chemically or physically benefited by lime. It may be used to improve the texture or tilth of both heavy clays and sandy loams, to neutralize sourness and promote nitrification, and as a supplier of lime (an element necessary for plant growth) for all soils deficient in that constituent. From these functions, marl, it will be seen, may be used to advantage on a very large class of soils, but it cannot be regarded as a substitute for barnyard manure. Neither can it rightly be styled a fertilizer, a term restricted in commerce to those materials which furnish one or more of the essential constituents of plant food—nitrogen, phosphoric acid and potash.

Marl is known sometimes, agriculturally, as 'mild lime,' and this term is justified largely by the fact that an excessive application does not work that injury to the soil which follows large applications of quick or caustic lime.

GYPSUM OR LAND PLASTER.

Gypsum is a naturally-occurring sulphate of lime, and samples of good quality show very little foreign matter. When crushed or ground it forms the well-known land plaster. Three samples are now reported upon.

Analysis of Gypsum.

—	No. 1.	No. 2.	No. 3.
	p.c.	p.c.	p.c.
Sulphate of Lime	92·79	93·82	46·19
Mineral matter insoluble in acid	2·76	·12	53·53
Undetermined	4·45	6·06	·28
	100·00	100·00	100·00

No. 1.—Windsor Plaster Co., Windsor, N.S.

No. 2.—Great Northern Mills, Cape Breton, N.S.

No. 3.—Forwarded by farmer at Beloeil, Que.

Nos. 1 and 2 are samples of excellent quality, but No. 3 is decidedly inferior, containing more than half its weight of insoluble rock matter.

Land plaster must be regarded as an amendment rather than as a fertilizer, and its agricultural value will depend largely on the nature of the soil and the character of the crop to be sown. Though furnishing lime for the growth of crops it is of no value to correct sourness, and therefore cannot be used in the place of lime, ground limestone or marl, on soils suffering from acidity. It improves the physical condition of heavy clay loams and of soils affected with 'black alkali.' Its chief value, however, would appear to lie in its ability to liberate potash from the inert stores in the soil, and it is for this reason probably that its application has proved beneficial to legumes, and especially to clover and peas. The best way to use it is through the stable. If sprinkled daily on the floor it will perform a most valuable service in preventing loss of ammonia from the liquid portion of the manure, and, of course, will eventually find its way to the soil with the application of the manure.

MUDS.

The samples of these materials examined since the issue of the last report are briefly discussed in the following paragraphs:—

Laby. No. 8776.—From Elliott Vale, P.E.I., and underlying a deposit of black, swamp muck. As received it furnished the following analytical data:—

Moisture	18·73	per cent.
Organic and volatile matter	31·15	"
Carbonate of lime	42·33	"
Clay, sand, etc.	6·64	"
Undetermined	1·15	"
	100·00	
Nitrogen	1·15	"

This 'mud' is especially rich in carbonate of lime.

Though not of the highest quality, it would be found useful for the improvement of soils deficient in lime and those poor in vegetable matter.

Laby. No. 8573.—From St. George, N.B. A typical 'mussel mud,' consisting of many mussel shells embedded in a matrix of clay rich in organic matter. The air-dried sample contained 24·90 per cent carbonate of lime and 14·98 per cent of organic matter. In fertilizing constituents the following results were obtained:—

Nitrogen	·417	per cent.
Phosphoric acid	·16	"
Potash	·25	"

This is one of the best samples of mussel mud we have examined, both as to lime and nitrogen content. An occasional application to soils requiring enrichment in these constituents would no doubt give a good return.

Laby. No. 8259.—From Pedder Bay, Metchosin, B.C. This was forwarded under the name of 'clam-shell mud,' though evidence of the presence of clams was not apparent. It is reported as covering the flats of the bay to a depth of six inches or so. It is very slimy, tenacious and has a disagreeable smell. Its application, according to accounts has usually resulted in increased yields. In the air-dried condition it afforded the following data:—

Moisture	2·18	per cent.
Organic and volatile matter	3·15	"
Carbonate of lime	3·55	"
Clay and sand	87·09	"
Phosphoric acid	·21	"
Potash	·14	"
Undetermined	3·68	"
	100·00	"
Nitrogen, in organic matter	·08	"

The amounts of plant food present are not larger than in soils of medium fertility. Possibly its value lies, in part, in its effect upon the physical condition of the soil and in part in the fair degree of availability of its fertilizing constituents.

Laby. No. 7656.—From Little Harbour, P.E.I. This was dug from the bed of a river. It consisted essentially of clay more or less rich in organic matter, with a few shells. Air-dried it contained 3·0 per cent of carbonate of lime and 16·94 per cent of organic matter. The nitrogen content was .78 per cent.

The value of this 'mud' would, in all probability, be most apparent on light soils, poor in humus. As it is so low in manurial elements, its profitable use would be largely governed by the expense in digging and putting on the land.

MUCKS.

Laby. No. 8039.—Swamp muck from a deposit 7 to 10 feet in depth, on the Nashwaak River, near Fredericton, N.B. Its analysis, after air-drying, furnished the following figures:—

Moisture	8·43	per cent.
Organic matter	49·46	"
Clay, sand, etc. (by difference)	42.11	"
	100·00	"
Nitrogen, in organic matter	1·50	"

Though not a muck of the highest quality, it might be worth using on soils that are not well supplied in humus. By composting the muck, as with barn-yard manure, its value no doubt would be enhanced; in the crude, raw condition, its application would not be likely to give any immediate response.

Laby. Nos. 8387-8.—Two mucks from Cambridge Station, N.S. The following data were obtained on the air-dried samples:—

MUCKS FROM CAMBRIDGE STATION, N.S.

Constituents.	No. 8387.	No. 8388.
	p.c.	p.c.
Moisture	8·36	7·73
Organic and volatile matter	83·30	84·48
Clay, sand etc. (by difference)	8·34	7·79
	100·00	100·00
Nitrogen, in organic matter	1·78	1·73

These are good mucks, though somewhat peaty in character. If first used as a litter or composted, their plant food would be rendered more available.

Laby. No. 8623.—A muck from West Summerland, B.C. As received, it had the following composition:—

Moisture	17·52	per cent.
Organic and volatile matter	59·74	"
Carbonate of lime	13·15	"
Clay, sand, etc	8·62	"
Undetermined	·97	"
	100·00	"
Nitrogen, in organic matter	1·95	"

The distinguishing features of this sample are the high lime-content and the richness of its organic matter in nitrogen.

Laby. No. 8645.—Muck from S.R., Grey County, Ontario:—

Moisture	4·13	per cent.
Organic and volatile matter	14·59	"
Clay, sand, etc	70·80	"
Undetermined	10·48	"
	100·00	"
Nitrogen, in organic matter	·38	"

This, is properly speaking, not a muck, but rather a soil rich in vegetable matter, and one that if well drained and worked should give good results.

Laby. No. 8389. From Churchill, Ont. This sample of muck or muck soil, afforded the following analytical data:—

Moisture	8·37	per cent.
Organic and volatile matter	35·74	"
Clay, sand, etc. (by difference)	55·89	"
	100·00	"

Fertilizing constituents—

Nitrogen	1·38	"
Phosphoric acid	·34	"
Potash	·22	"
Lime	2·92	"

This might also be classed as a soil, though considerably richer in vegetable matter than the foregoing sample. Its successful culture would, in the first place, depend upon good drainage.

PEAT.

Two samples of prepared peat from the Government bog at Alfred, Ontario, were submitted to analysis with a view to determining their agricultural value.

Analysis of Peat.

—	No. 1. — Laboratory No. 8661.	No. 2. — Laboratory No. 8662.
Moisture	24·07	27·78
Organic and volatile matter	71·23	67·81
Mineral matter or ash	4·70	4·41
	100 00	100·00
Nitrogen	1·28	1·27
Composition of Ash—		
Mineral matter insoluble in acid	19·30	17·46
Oxide of Iron and Alumina	23·30	20·20
Lime	23·80	25·00
Phosphoric Acid	·80	·60
Potash	·65	·48

A sample of the ash of peat, as produced in an open grate, was forwarded with an inquiry respecting its manurial value as compared with wood ashes. It gave the following data:—

Lime	26·45	per cent.
Phosphoric acid	·80	"
Potash	·69	"

Though distinctly inferior to good, unleached wood ashes, it is evident that the peat ashes have a fertilizing value, and would be found more particularly useful for soils deficient in lime.

CREMATORY ASHES.

Two samples of ashes from the crematory at Vancouver, B.C., were received in September (No. 1), and October (No. 2), 1910, with a request for information as to the fertilizing value of this refuse.

ANALYSIS OF CREMATORY ASHES.

Constituents.	No. 1. — Laboratory No. 8240.	No. 2. — Laboratory No. 8401.
	p. c.	p. c.
Moisture	1·45	·93
Organic and volatile matter	6·24	5·70
Insoluble mineral matter	41·23	42·15
Mineral matter soluble in acid (by difference)	51·08	51·22
	100·00	100·00
Fertilizing constituents—		
Nitrogen	·041	·087
Phosphoric Acid	1·40	1·81
Potash	·92	1·27
Lime	19·90	19·74

The percentages of phosphoric acid and potash are such as to give the ashes a distinct value as a source of these elements of plant food, but it is as a material rich in lime that it must be chiefly regarded. It should prove a useful amendment for soils naturally deficient in lime, sour, ill-drained soils and muck or peaty lands, and also for improving the tilth of heavy clay loams. The larger proportion of the lime exists as carbonate, and as such is well adapted for application to most soils.

Two samples of ashes from this crematory were analysed in 1896, and a very marked difference between them and those now reported upon—more especially in phosphoric acid—is to be observed.

FERTILIZING CONSTITUENTS IN CREMATORY ASHES.

(Pounds per ton.)

—	1896.		1910.	
	A.	B.	No. 1.	No. 2.
Phosphoric Acid	233	26	28	36
Potash	35	43	18	25

The large phosphoric acid content of the 1896 samples (collected in August and November) is accounted for by the fact that a very considerable proportion of the garbage then burned consisted of bones. From the present samples it may be concluded that the bones are now otherwise disposed of, and as a result the crematory ashes are the poorer.

ASHES FROM REFUSE PAPER, SWEEPINGS, ETC.

Laby. No. 7786.—In the following data are given the fertilizing value of ashes from the burning of waste paper, floor sweepings, etc., etc., as resulting from the daily cleaning of a large educational institution in Quebec province. The figures no doubt are fairly representative of material of this kind:—

Moisture	·64	per cent.
Organic and volatile matter	9·30	"
Mineral matter insoluble in acid	71·37	"
Mineral matter soluble in acid (by difference)	18·69	"
	100·00	"
Nitrogen	·17	"
Phosphoric acid	·34	"
Potash	·64	"
Lime	4·87	"

The results indicate a very low fertilizing value, but the ashes would on some soils—both heavy and light—be of additional use from their lime-content.

SOOT.

A sample of soot, Laby. No. 7706, taken from the bottom of a large power-house chimney, St. John, N.B., has been examined. Coke, it is stated, was the principal fuel used.

Moisture	6·74	per cent.
Organic and volatile matter	49·19	"
Ash	44·07	"
	100·00	"
Nitrogen	1·76	"
Phosphoric acid	·14	"
Potash	·27	"

A sample of soot collected last summer from a chimney in one of the residences on the Experimental Farm, Ottawa, the fuel used being hard coal, gave 1·53 per cent nitrogen; and one from St. Catharines, Ont., 1·04 per cent nitrogen.

The chief fertilizing value of soot lies in the nitrogen it contains which is very largely present as sulphate of ammonia, a form readily available for plant growth. It contains, in addition, small quantities of phosphoric acid and potash. Soot is a variable material, and particularly so as to its nitrogen-content, and hence samples obtained under different circumstances have often widely different values.

Its principal use has been as a top dressing for cereals and pastures. It is also employed in the greenhouse and garden, where it acts beneficially both as a fertilizer and in preventing the attack of certain pests.

WHEAT STRAW ASH.

Over large areas in the Northwestern provinces, the only practical method at present of disposing of the large amount of straw from the wheat fields is by fire. The straw may be burnt in large piles and, again, may be used as fuel for threshing

machines. From the agricultural standpoint, the burning of straw is a wasteful process, depriving the land of considerable amounts of nitrogen and humus-forming material, which with the aid of stock would naturally enrich the soil. But it may be asked, is there any loss of mineral matter—ash constituents—in the burning of the straw? To answer this inquiry we submitted to analysis a sample of the clinker ash obtained by a correspondent at Macleod, Alta. The ash heap had been formed by the burning of large quantities of wheat straw. The sample was quite black, of a vitreous, lava-like character and brittle. On analysis it was found to have the following composition:—

Organic and volatile matter (chiefly carbon)	17·95	per cent.
Mineral matter insoluble in acid (chiefly silica)	76·39	"
Oxide of iron and alumina	·64	"
Lime	·39	"
Magnesia	·37	"
Potash	4·06	"
Phosphoric acid	·19	"
Undetermined	·01	"
	100·00	"
Potash, by lixivation with cold water	·425	"
Potash, after treatment with caustic lime and lixivation with water	·461	"

While it is quite evident that this ash has a decided fertilizing value, chiefly from its notable percentage of potash, it is equally evident since wheat straw contains from 10 per cent to 15 per cent of potash, that there has been a very considerable loss in this element, due to volatilization in the burning of the straw or to subsequent leaching of the ash heap by rain.

SEA-WEED.

In several of our former reports (1894, 1901, 1905) we have called attention to the manurial value of the sea-weeds as cast up both on the Atlantic and Pacific coasts of the Dominion, giving data as to their composition and indicating how they may be profitably used by those whose farms are not too far distant from the shore. We are fully aware that large numbers of farmers, more especially in Nova Scotia, are cognizant of the worth of sea-weed, and employ it liberally in the upkeep of the fertility of their soils, but we also know there are very many who could readily obtain this sea manure at small cost but who, possibly from ignorance as to its value, neglect to gather it.

Our results in the past have pointed to considerable variation in composition among sea-weeds, so that certain species appear to be much richer in the fertilizing elements than others; and, further, it has been shown that the composition of any particular species or kind may vary markedly with the season at which it is collected. It was to obtain further information of a definite character respecting the manurial value of a number of varieties occurring in the lower St. Lawrence that the following analyses have been made. The samples were collected towards the end of October at Isle Verte, on the south shore of the river, 131 miles below Quebec, the sea-weeds being taken out of the water at some little distance from the shore, allowed to drain until apparently free from all mechanically held water and forwarded to the laboratory in hermetically sealed jars.

A brief description of the sea-weeds examined, with their scientific and common names, has been kindly furnished by Mr. H. T. Güssow, Dominion Botanist.

No. 1. *Fucus vesiculosus*, L. Common Bladder Wrack.—This is one of the larger and commoner sea-weeds. The body of the plant (thalus or 'frond') is dark brown or almost black in colour and much branched, the method of branching being a repeated forking of a branch or segment into smaller ones. The whole plant may reach a length of three feet and the segments a breadth of two inches. Each branch is a ribbon-like structure with a distinct mid-rib. It is usually provided with prominent air-bladders, spherical or more usually elongated in form, arranged in pairs, one on each side of the mid-rib so as to form two regular rows.

No. 2. *Ascophyllum nodosum*, (L), Le Jolis.—This is somewhat similar to the preceding but the branching is more of a feathery (pinnate) type, the thallus branches have no mid-rib and the air-bladders are arranged in a single row along the middle line of each.

No. 3. *Porphyra laciniata*, (Lightf.) Ag.—In this species, the thallus is extremely thin and delicate, being almost transparent in places. It is broad and somewhat leaf-like in form, and irregularly slit or indented into a number of lobes; the margins wavy; the colour bluish or greenish with various shades of brown or red-purple, often becoming violet in drying. The entire plant is from four to six inches in length.

No. 4. *Laminaria longicruris*, Dela. Pyl.—This resembles Nos. 1 and 2 in being a brown sea-weed but is totally different in form. The frond is a long, flat expansion resembling the blade of a leaf, and supported below by a tough and very flexible stalk. This in turn is attached at its base to a root-like organ. The blade is without any mid-rib or air-bladders and the margin may be more or less wavy.

ANALYSIS OF FRESH SEA-WEED.

—	No. 1. — *Fucus vesiculosus.*	No. 2. — *Ascophyllum nodosum.*	No. 3. — *Porphyra laciniata.*	No. 4. — *Laminaria longicruris.*
	p. c.	p. c.	p. c.	p. c.
Water	88·29	75·14	79·42	88·30
Organic matter	7·61	19·30	15·15	7·15
Ash	4·10	5·56	5·43	4·55
	100·00	100 00	100·00	100·00
Nitrogen	·182	·273	·928	·251
Phosphoric Acid	·037	·070	·058	·134
Potash	·615	·619	·619	1·546
Lime	·194	·421	·515	·075
Value per ton	$1.27	$1.63	$3.86	$2.56

Very considerable differences are to be noted in the water-content, and hence in the 'dry matter,' of these varieties. This is possibly explained in part by differences in the stage of growth or maturity of these sea-weeds at the time of collection. It is of interest to note that while the varieties differ so widely in their organic matter content, they do not show corresponding differences in ash; thus we have, comparing the extremes in organic matter (7·15 and 19·30) a difference proportionately twice that found between the extremes in ash (4·10 and 5·56). We do not find that the percentage of dry matter is any sure indication of relative fertilizing value, for No. 4 with 11·7 per cent dry matter contains 1·546 per cent potash, while No. 2 with 24·86 per cent, contains less than one-half that amount, namely, ·619 per cent potash. This variation will be more apparent when considering the data given in the next table, in which is considered the composition of the dry matter. Of the varieties now com-

pared, *Porphyra laciniata* is by far the richest in nitrogen and *Laminaria longicruris* the richest in potash. In phosphoric acid, the percentage of which is always low in sea-weed, the differences are not of the same economic interest.

The difference in total ferttlizing value of the sea-weeds has been brought out by assigning to their nitrogen, phosphoric acid and potash the prices given to these elements in commercial fertilizers, and the results of the calculation give figures ranging from \$1.27 to \$3.86 per ton.

SEA-WEED—Composition of Dry Matter.

	No. 1. — *Fucus vesiculosus.*	No. 2. — *Ascophyllum nodosum.*	No. 3. — *Porphyra laciniata.*	No. 4. — *Laminaria longicruris.*
	p. c.	p. c.	p. c.	p. c.
Organic matter	64·98	77·63	73·61	61·11
Ash	35·02	22·37	26·39	38·89
	100·00	100·00	100·00	100·00
Nitrogen	1·56	1·09	4·50	2·14
Phosphoric Acid	·32	·28	·33	1·14
Potash	5·25	2·48	3·00	13·21
Lime	1·66	1·69	2·64	·61

In the above table, the composition of the dry matter of the sea weeds is given. Nos. 1 and 4 are fairly similar as regards organic matter and ash, and the same may be said respecting Nos. 2 and 3. In the former group the ash constitutes about one-third and in the latter about one-fourth, of the dry matter.

The nitrogen-content of the dry matter varies greatly, and consequently the air-dried sea weeds would possess widely different values from the standpoint of a nitrogenous fertilizer. *Porphyra laciniata* is exceptionally high in nitrogen, while *Laminaria longicruris* contains twice as much as *Ascophyllum nodosum,* which is the poorest of the series.

In phosphoric acid the first three members of the series are much alike, containing an amount approximately one-fourth that in the *Laminaria.* Sea weed is not generally regarded as a phosphatic fertilizer, though no doubt its ready decay in the soil makes the small amount of phosphoric acid contained quickly available and hence valuable.

Sea-weed is essentially a potassic manure, though, as we have seen, it also furnishes a notable amount of nitrogen. The percentages of potash in the dry matter of the specimens analysed, it will be observed, vary very considerably, from 2.48 per cent in the *Ascophyllum* to 13.21 per cent in the *Laminaria,* the latter apparently being an exceptionally high result.

The fertilizing value of sea-weed is enhanced by its ready decomposition in the soil; it quickly liberates its constituents in forms available for plant nutrition. Though furnishing a considerable amount of organic matter, its decay does not probably add much to the humus-content of the soil, so complete may be its decomposition. For the reason that its plant food is so readily available, there is no necessity for allowing it to rot before application to the soil. Little loss, however, can ensue if composting is resorted to by mixing it with good manure, muck or other material which would absorb the decomposition products. On the whole, however, its immediate incorporation with the soil would appear to be the best plan.

Piling it on the sea shore and allowing it to partially dry out will certainly lessen the haulage to the field, but it must be remembered that if during this process it is exposed to heavy rains, much of its potash will be washed out and lost. The weathering of sea-weed has been demonstrated to be a wasteful process.

Sea-weed can be used for all classes of crops, but those most benefited are roots, vegetables and others which produce an abundance of foliage, since it is essentially a potassic and nitrogenous fertilizer. This latter fact prompts the suggestion that if a complete fertilizer is required it should be supplemented by an application of superphosphate or basic slag.

Dried, Ground Sea-weed.—Some months ago we received from a correspondent a sample of dried, ground sea-weed prepared, according to statement, from 'Rock Weed' (probably *Fucus furcatus*), gathered on the Nova Scotian coast and dried at a gentle heat. The object had been to produce from sea-weed a fertilizer sufficiently rich in plant food to allow of inland transportation, and which could conveniently be applied to the land. It was a coarse, dark-green powder, and one which might, we think, be readily broadcasted or applied by the fertilizer attachment of the drill.

ANALYSIS.

Moisture	9·48	per cent.
Organic matter	72·61	"
Mineral matter or ash	17·91	"
	100·00	"
Nitrogen	1·32	"
Phosphoric acid	·29	"
Potash	2·26	"
Lime	1·72	"

These data are fairly in accord with those obtained from the analysis of fresh Rock weed, calculated to the same moisture-content as the sample examined. We may conclude, therefore, that there had been no marked losses in the plant food constituents during the drying of the weed, and I think we may further safely infer that the operation has not impaired their availability.

Attempts have been frequently made in Europe to prepare an easily-handled, concentrated fertilizer from sea-weed, but it would appear that so far mechanical and other difficulties have been such as to prevent the manufacture of the material being a profitable undertaking.

DOG FISH SCRAP.

Since 1905 at the request of the Department of Marine and Fisheries, we have annually analysed samples of the dogfish scrap from the government reduction works in the maritime provinces. Two samples from the works at Canso, N.S., received at the laboratory in December, 1910, furnished the following data:—

ANALYSIS.

	No. 1.	No. 2.
	p.c.	p.c.
Moisture	3·15	5·32
Nitrogen	9·41	9·50
Phosphoric acid	4·05	3·56
Total mineral matter	11·85	11·01
Mineral matter insoluble in acid	·74	·07
Oil	26·50	25·11

These samples are essentially the same and practically of equal fertilizing value. The data agree fairly closely with those obtained in previous years, and show that this material is to be regarded more particularly as a nitrogenous fertilizer. It is, however, one, also, that may furnish a notable amount of phosphoric acid. Valuing its nitrogen at 13c., and phosphoric acid at 5c. per pound, No. 1 is worth $29.02, and No. 2, $28.26, per ton.

The use of dogfish scrap on the farm and in the garden has been dealt with in previous reports, and various formulæ have been given for the preparation of fertilizers to meet special needs. For information of this character the reader is more particularly directed to the report of this Division for 1906.

INSECTICIDES AND FUNGICIDES.

LIME-SULPHUR WASHES.

This spray continues to grow in popularity, both as an insecticide and a fungicide. With many orchardists, its use has entirely taken the place of Bordeaux mixture. At first employed simply as a winter spray on dormant wood to destroy scale insects, it is now still more widely, in a diluted form, coming into favour for summer use to combat the attacks of injurious fungi.

The tendency now among orchardists is to purchase the commercial concentrated article rather than to go through the somewhat troublesome operation of preparing the wash on the farm from its constituents, lime and sulphur. The commercial wash keeps well if air is carefully excluded, and simply requires dilution to be ready for use. In the annual report of this Division for 1908 and 1909, the whole subject of these lime-sulphur sprays has been discussed, giving formulæ and directions for the home preparation of the wash and the composition of the more important commercial brands on the market.

The analyses given in the subjoined table have been obtained from the examination of certain samples sent in during the past year. They represent, for the most part, the composition of brands newly introduced on the Canadian market.

LIME-SULPHUR WASHES.

Laboratory No.	Brand or Manufacturer.	Specific Gravity.	Sulphur in Solution. Total.	Sulphur in Solution. As Sulphide.
			p. c.	p. c.
8181	Acadia brand, Wolfville, N.S.	1·191	15·51	13·31
8182	Niagara brand, Burlington, Ont.	1·306	21·97	21·60
8840	Lion brand, Brooklyn, N.Y.	1·300	26·09	25·39
8910	Acadia brand, Wolfville, N.S.	1·302	25·72	25·33
8934	Pendray & Sons, Victoria, B.C.	1·301	26·58	26·12
8935	Victoria Chemical Co., Victoria, B.C.	1·300	25·36	24·83
8936	Ortho Lime-sulphur solution, Calif. Spray Chemical Co.	1·311	26·26	25·70

No. 8181.—This sample was from one of the first batches made at the recently established factory at Wolfville, N.S. It is seen to be decidedly lower in sulphur-content than the brands now generally put upon the market. Possibly this inferiority

in quality was the result of faulty preparation. That it was not the intention of the manufacturers to sell a wash of inferior quality may, we think, be deduced from the figures of No. 8910, a sample of the same brand sent in some two months later and which was found to be quite satisfactory and of normal strength.

The sample of Niagara brand (No. 8182) is practically identical in composition with that previously analysed, indicating a carefulness to obtain, from year to year, uniformity in strength.

No. 8840.—The Lion brand, manufactured by the James A. Blanchard Company, Brooklyn, N.Y. This is a satisfactory and well-made wash, of full strength both as regards total sulphur and that present as sulphides.

Nos. 8934, 8935 and 8936, are brands sold in British Columbia, the first two being of Canadian manufacture and the last imported from California. The data indicate that these samples are very similar in composition and of full strength. Relatively they would be placed in the order of their 'sulphur as sulphide' since it is upon the soluble sulphides that the efficiency of the spray depends.

A determination of the total soluble sulphur-content and that of the sulphur present as sulphide requires chemical analysis, but it may be of some assistance to the orchardist to remember that a well-made, full strength lime-sulphur wash is of a deep orange-red colour, clear or with very little sediment.

ARSENATE OF LEAD.

The composition of the better-known commercial brands of Arsenate of Lead and the preparation of the home-made article, were discussed in the report of this Division for 1909. No general examination of the brands of this insecticide has been made during this past year, but an example of faulty preparation, resulting in an impure product, having been brought to our notice we were able by analytical work and advice to assist the manufacturer in eventually turning out a satisfactory product of full strength.

Another case brought to our notice was that of an impure lead arsenate, which contained a very large percentage of free arsenious acid and consequently was quite unsuitable for use as an insecticide. This, on our representations, was withdrawn from the market.

In addition to the foregoing, three brands not hitherto reported on by us have been analysed, the results being as follows:—

ANALYSIS OF ARSENATE OF LEAD.

Constituents.	Laboratory No. 8180.	Laboratory No. 8839.	Laboratory No. 8949.
Water	49·99	40·17	50·00
Total arsenic oxide	14·73	14·60	12·65
Total lead "	31·56	41·38	31·80
Soluble impurities	2·98	2·00	4·83
Insoluble " (by difference)	·74	1·85	·72
	100·00	100·00	100·00
Soluble arsenic oxide	·14	·44	·21
" lead "	nil.	nil.	nil.

Laby. No. 8180—Merrimac Chemical Co., Boston, Mass., U.S.A.
" 8839—Lion Brand, Jas. A. Blanchard Co., N.Y., U.S.A.
" 8949—Acadia Brand, Wolfville, N.S.

As regards moisture-content, Nos. 8180 and 8949 are practically identical, but the former is somewhat the more satisfactory brand of the two, being richer in arsenic and containing less soluble impurities. No. 8839 is also a genuine and well-made brand and quite satisfactory as to strength and purity.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The fourth year's work in this investigation closed on February 28, 1911. The data obtained, together with the precipitation results, allow us to calculate, approximately, the amount of combined nitrogen furnished to the soil per acre, in the vicinity of Ottawa, for the year preceding that date. In the following table are recorded the totals for the precipitation, the average amounts of nitrogen present in the three forms and the pounds of nitrogen per acre so supplied.

RAIN and Snow at Ottawa for the Year ending February 28, 1911.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per Acre.
	Rain.	Snow.	Total as Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia	In Nitrates and Nitrites.	Total.	
1910.				p.p.m.	p.p.m.	p.p.m.	p.p.m.	
March	·99	4·50	1·44	·381	·520	·420	1·321	·431
April	2·06	....	2·06	·412	·223	·295	·930	·434
May	1·86	....	1·86	·767	·096	·253	1·116	·470
June	1·24	....	1·24	·374	·064	·202	·640	·180
July	2·38	....	2·38	·805	·133	·373	1·311	·707
August	4·32	....	4·32	·613	·078	·269	·960	·940
September	2·06	....	2·06	·575	·072	·365	1·012	·472
October	3·69	·75	3·76	·496	·037	·244	·777	·662
November	·85	9·50	1·80	·353	·050	·160	·563	·230
December	....	16·50	1·65	·525	·077	·140	·742	·277
1911.								
January	·02	15·50	1·57	·338	·051	·088	·477	·169
February	·20	26·25	2·83	·163	·132	·171	·466	·299
Total for 12 months	19·67	73·00	26·97	....	....	....	....	5·271

The total precipitation for the year was 26·97 inches, practically 10 inches below the average for this locality. The rainfall was 19·67 inches and the snowfall 73·00 inches, both considerably less than usual. The precipitation during the four months—April, May, June and July—though fairly well distributed was very much lighter than for the same months during the past four years and the totals for November and December are also decidedly lower than those which we have hitherto recorded for these months.

The total amount of nitrogen furnished per acre for the year is 5·271 pounds, about one pound more than we obtained for the first year of observation, but markedly less than the abnormally high results obtained for the year ending February, 1909, (8·364 pounds per acre), which were accounted for by the fact that for two months of the summer of 1908 the atmosphere in this vicinity was heavily charged with smoke from bush fires. The present figure (5·271 lbs.) is practically the mean of the quantities recorded for the two years 1908 and 1910 (5·596 lbs.) as may be deduced from the results in the following tabulated statement:—

PRECIPITATION AND AMOUNT OF NITROGEN PER ACRE, OTTAWA, 1908-1911.

—	Rain in Inches.	Snow in Inches.	Total Precipitation in Inches.	Pounds of Nitrogen per Acre.
Year ending February 29, 1908	24·05	133·0	37·35	4·322
" " 28, 1909	22·99	96·25	32·63	8·364
" " 28, 1910	28·79	80·75	36·87	6·869
" " 28, 1911	19·67	73·00	26·97	5·271
Average for 20 years	25·23	91·58	34·39	

Of the total amount of nitrogen furnished per acre, 5·271 lbs., approximately 84 per cent, or 4·424 lbs. was furnished by the rain, and 16 per cent, or ·847 lbs. by the snow. These proportions (though not the amounts) are practically identical with those of the previous year.

AVERAGE NITROGEN-CONTENT OF RAIN AND SNOW.

(Amount of Nitrogen per acre, as Free and Albuminoid Ammonia and as Nitrates and Nitrites.)

—	Number of Samples Analysed.	Precipitation in Inches.	Nitrogen. Parts per Million. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	Percentage of Total. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Per Acre. As Free and Albuminoid Ammonia.	As Nitrates and Nitrites.
										Lbs.	Lbs.
Rain	51	19·67	·575	·122	·295	·992	58	12	30	3·109	1·315
Snow	30	73·00	·286	·092	·134	·512	56	18	26	·624	·223

In the case of the rain, 70 per cent of its nitrogen appeared as free and organic ammonia, and 30 per cent as nitrates and nitrites. In the snow we find 74 per cent as free and organic ammonia and 26 per cent as nitrates and nitrites.

From the data in the above table. we also find that of the total amount of nitrogen per acre, 5·271 lbs., there are 3·733 lbs. present as free and albuminoid ammonia and 1·538 lbs. as nitrates and nitrites.

THE WATER SUPPLY OF FARM HOMESTEADS.

What is the nature of this supply? From correspondence and observation, we learn that on the larger number of farms it is still the shallow well, dug to a depth of say 9, 15, 25 feet, in the barn-yard, in one of the farm buildings, near the back door or in some similar location. Such wells are in great danger of pollution, by soakage through soil possibly saturated with excrementitious filth and from surface washing. We have enlarged in many of our former reports upon the menace to health from the

use for domestic purposes of a water charged with organic matter of an excretal origin and possibly, therefore, we need not here repeat in detail the dangers of a polluted supply. But we feel compelled to add that the more experience we gain the more we are assured that these wells do not long escape contamination. For a few years after the homestead is established the water may remain good, but sooner or later, according to the nature of the soil and other conditions, the ground becomes unable to perform its useful work of filtration and purification, allowing the water percolating through it to carry its load of manurial matter to the well. It seems almost inevitable that the shallow, unprotected well, situated as we have indicated, must become polluted. Some protection is assured by lining the well, say to a depth of 10 feet or so, with concrete or puddled clay several inches thick and protecting the mouth of the well against the entrance of surface water, frogs, etc., but it does not altogether remove the objection to shallow wells placed in proximity to sources of contamination.

The problem of finding an ample supply of pure, wholesome water may be in certain parts of the three Northwestern provinces a difficult one, and recourse must frequently be had to distillation to obtain water free from alkaline or saline matter and fit for drinking purposes. But in British Columbia, Ontario and eastern Canada generally, this difficulty does not exist, and on the majority of farms pure water of excellent quality may be obtained. This may at times be a matter of some expense, but it is money well spent, for there is nothing on the farm more valuable, looked at from any standpoint, than a never-failing supply of pure wholesome water. Apart from lakes, unpolluted streams and natural springs so situated that their waters must of necessity be pure, the farmer must look, in the larger number of instances, to the drilled, bored or driven well for his supply. By such means, he taps those subterranean reservoirs that yield water of the highest degree of organic purity and free from disease-producing germs. This is the class of wells we advise. These deep-seated waters are as a rule satisfactory in every respect, and we are glad to find them more and more replacing the shallow, barn-yard well on the Canadian farm homestead.

Our work in the examinations of waters from farms, cheese factories and creameries has been continued uninterruptedly from the establishment of the Experimental Farms. As a result, we have on record the analyses of several thousand well waters. This work is, we believe, bearing good fruit, in the improvement of supplies and in directing attention to the matter of the proper location of the well and its subsequent protection from contamination. Every year sees an increased correspondence from all parts of the Dominion on this important, indeed, vital subject, and the assistance we have been able to give, by advice and analysis, has, we feel, been of considerable value towards the establishment and maintenance of pure water supplies for the rural home. As far as may be possible or practicable, we are pleased to advise farmers in this matter, and those desirous of an analysis of their supply are asked to write to the Chemical Division, Experimental Farm, Ottawa, for a copy of the directions to be followed in the collection and shipment of the sample.

During the year 289 samples were received, but of these only 130 were submitted to a complete sanitary analysis. Of the remainder some were examined as to the presence of alkali or an excessive saline content, while many had to be rejected for the reason that in one particular or another the instructions had not been followed in the collection of the sample. The table of 'samples received,' on page 163, indicates the number sent from the several provinces.

In the appended table, the analytical data of the 130 waters, together with a brief pronouncement as to their quality, are given. We conclude that of these 43 were pure and wholesome, 36 suspicious and probably dangerous, 33 seriously polluted and 18 saline.

ANALYSES OF WELL WATERS, 1910-11.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
1	Grenfell, Sask	T.S.	April 11	·012	·450	·175	10·0	5432·0	4654·0	778·0	None	Saline.
2	Brandon, Man.	J.M.	" 12	·010	·055	·005	26·0	600·0	488·0	112·0	"	Suspicious.
3	Semans, Sask	A.S	" 12	·065	·330	2·450	54·0	1668·0	1357·6	310·4	"	"
4	Harrisville, N.B.	A.M.N.	" 13	·020	·010	1·235	9·0	121·6	99·2	22·4	Free	Free from organic pollution.
5	Bathgate, Alta.	W.A.B.	" 29	·105	1·230	20·946	29·0	3326·0	3016·0	310·0	......	Saline.
6	Penticton, B.C.	E.G., No. 1	" 29	·012	·345	·039	4·5	466·0	364·0	102·0	......	Wholesome.
7	"	E.G., No. 2	" 29	Trace.	·210	Free.	4·5	432·0	354·0	78·0	......	"
8	Milner, B.C.	H.A.McD.	May 2	·680	·060	Trace.	500·0	1304·0	1249·6	54·4	Free	Saline.
9	Crystal City, Man.	R.G.	" 16	·065	·91	20·07	422·0	5232·0	4540·0	692·0	Hy. traces	"
10	Fulford, Que.	F.T.E.	" 21	·05	4·11	14·95	62·0	442·4	388·0	54·4	V. s. trace	Very seriously polluted.
11	Brightwater, B.C.	H.R.	" 23	·06	·06	·024	9·0	1523·2	1224·8	298·4	Free	Wholesome.
12	Lake Coteau, Sask	P.S.H.	" 25	·26	·08	·094	6·0	769·6	689·6	80·0	"	Suspicious.
13	Kirk's Ferry, Que	A.F.B.	" 31	·03	·23	1·342	Free.	141·6	85·6	56·0	Hy. traces	Free from pollution.
14	Lancaster, Ont	D.McL.	" 31	·265	·070	·119	49·0	614·4	485·6	128·8	Trace	Very seriously polluted.
15	Vankleek Hill, Ont	J.A.R.	June 2	3·38	·32	16·45	140·0	1190·4	1024·8	165·6	Sl. trace	Seriously polluted.
16	Almonte, Ont	J.R	" 4	·05	·03	·214	15·0	388·0	333·6	54·4	Free	Suspicious.
17	Carleton Place, Ont	J.McK.	" 4	·345	·17	4·821	80·0	561·6	435·2	126·4	"	Very suspicious.
18	Salisbury, N.B.	P.J.G.	" 6	Trace.	·02	Trace.	6·2	288·8	272·8	16·0	"	Free from contamination.
19	North Bedeque, P.E.I.	A.F.	" 16	·04	·07	2·19	35·0	227·2	196·0	31·2	Trace.	Very suspicious.
20	Hurdman's Bridge, Ont	O.F.	" 16	·08	·95	8·499	186·0	1003·2	792·0	211·2	Free	Very seriously polluted.
21	Chelsea, Que	P.C	" 18	·03	·09	2·81	1·0	212·0	184·0	28·0	Trace.	Excellent.
22	Aylmer, Que	G.C.W.	" 18	·02	·072	·082	6·0	117·6	94·4	23·2	"	Free from organic contamination.
23	City View, Ont	J.W.	" 20	·17	·27	1·219	208·0	796·0	640·0	156·0	"	Very suspicious.
24	Almonte, Ont	Dr. D.P.L.	July 2	·03	·10	7·082	14·0	505·6	427·2	78·4	"	Highly suspicious.
25	Lancaster, Ont	D. McL.	" 8	·024	·07	·029	55·2	676·0	533·6	142·4	"	Suspicious.
26	Chedoke, Ont.	A.E.M.	" 15	Trace.	·086	3·27	112·0	1874·4	437·4	437·0	......	Polluted.
27	Kingsmere, Que	J.G.	" 18	·044	·054	·482	4·8	98·8	76·8	22·0	Free	Suspicious.
28	Brandon, Man.	J.M.	" 18	·026	·070	·139	33·2	645·0	455·0	190·0	"	Very suspicious.
29	Chateauguay Bassin, Q.	H.E.B.	" 20	·307	·228	6·86	32·0	553·6	444·0	109·6	Hy. traces	Polluted.
30	Westboro, Ont.	W.S	" 20	·065	·075	·105	19·2	414·4	302·4	112·0	Free	"
31	Cannington, Ont.	Mrs. W. J. C.	" 25	·345	·070	1·149	8·8	313·2	219·2	94·0	Sl. trace	"
32	Gananoque, Ont.	E. C.	" 30	·09	·03	·074	5·2	274·8	148·8	126·0	Free	Suspicious.
33	Alberta	D.D.K.	Aug. 4	4·99	·835	Free.	193·0	12472·0	......	......	......	Very saline.
34	Chateauguay Bassin, Q.	H.E.B.	" 6	·235	·12	2·76	20·8	496·8	317·6	179·2	Sl. trace	Contaminated.

ANALYSES OF WELL WATERS, 1910-11—*Continued.*

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
35	Kinburn, Ont.	W.G.	Aug. 10	·48	·15	·025	280·0	883·6	809·6	74·0	Free	Contaminated.
36	Winchester, Ont.	E.B.	" 15	·07	·05	3·664	211·0	897·6	618·0	279·6	"	Very suspicious.
37	Port Bruce, Ont	J.E. McC.	" 16	15·735	·04	·705	10800·0	25224·0	20076·9	5148·0	"	Strongly saline.
38	Winchester, Ont.	Mrs. R.W.	" 16	Free.	·04	Free.	30·6	447·2	294·0	153·2	V. s. trace	Suspicious.
39	Aylmer, Que	F.G.W.	" 17	·07	·03	·058	13·5	438·8	288·0	150·8	"	"
40	Sonya, Ont.	Mrs. R.W.	" 19	·02	·155	23·639	367·0	1740·0	1040·0	700·0	Trace	Probably seriously contaminated.
41	Irish Creek, Vernon, B. C.	E.G.	" 22	Free.	·04	Free.	2·6	526·0	333·0	193·0	Free	Free from pollution.
42	Woodlawn, Ont	J.J.M.	" 24	3·17	·115	Free	3880·0	9412·8	6882·4	2530·4	"	Saline.
43	Breboeuf, Q.	A.C., No. 1	" 26	Free.	·066	·165	Free.	89·0	23·0	66·0	"	Free fr. pollution—wholesome
44	"	A.C., No. 2	" 26	Free.	·03	·23	3·2	39·6	17·2	22·4	"	" "
45	Lynnfield, N.B.	A.B.G.	Sept. 7	·01	·02	·31	2·5	75·2	24·4	50·8	"	Free from contamination
46	Aylmer, Que.	F.G.W.	" 7	·09	·02	·01	13·0	432·8	256·8	176·0	Sl. trace	Probably free from pollution.
47	"	W.H.McL.	" 7	·13	·07	·03	3·9	302·8	172·8	130·0	Free	Very suspicious.
48	"	J.L.G.	" 7	·06	·04	Free.	70·0	583·2	378·0	205·2	Hy. trace	Suspicious.
49	Brightwater, B.C.	C.H.L.	" 8	·03	·47	Free.	4·0	130·8	52·0	78·8	Free.	Free from contamination.
50	Lakeview, Que	S.L.K., No. 1	" 19	Free.	·07	1·11	7·0	374·4	294·4	80·0	"	Free from pollution.
51	"	S.L.K., No. 2	" 19	Free.	·01	·74	4·0	306·0	192·8	113·2	"	" "
52	Irish Creek, Vernon, B.C.	E.G.	" 20	Free.	·025	Free.	Trace.	530·0	359·0	171·0	"	Excellent.
53	Dunham, Que	Miss. A.J.H.	" 23	·06	·05	·58	2·5	162·0	108·0	54·0	"	Very suspicious.
54	Moore's Mills, N.B.	G.O.D.	" 26	·02	·09	4·54	69·6	486·0	274·0	212·0	"	"
55	Elmsdale, P.E.I.	W.C.McK., No 1	" 30	Free.	·08	2·77	20·0	163·6	106·0	57·6	Hy. trace	Free from contamination.
56	"	W.C.McK., No 2	" 30	·02	·04	4·53	40·0	264·8	132·0	132·8	"	Suspicious.
57	Theodore, Sask.	W.T.S.	" 30	·67	·69	1·65	160·0	2062·0	1680·0	382·0	Free	Contaminated.
58	Belleville, Ont.	J.T.B.	Oct. 7	3·81	·16	Free.	3000·0	5453·0	4340·0	1118·0	Trace	Strongly saline.
59	Okanagan Mission, B. C.	F.T.	" 10	Free.	·22	Free.	2·0	461·2	281·2	180·0	"	Free from contamination.
60	Sandwich, Ont.	A.B.	" 12	Free.	·22	·31	72·0	588·8	374·8	114·0	Free.	Suspicious.
61	Hamilton, Ont.	W.A.	" 13	Free.	Free.	·17	7·0	2213·0	1956·5	256·5	"	Free from contamination.
62	Ottawa, Ont.	C.E.F.	Oct. 13	·004	·18	·10	·4	44·0	8·0	36·0	"	Wholesome.
63	Sutton, Que	W.A.W., No. 1	" 19	Free.	·04	·03	Free.	54·0	18·0	36·0	"	Free from pollution.
64	"	" No. 2	" 19	Free.	·08	Free.	Free.	52·0	12·0	40·0	"	" "
65	Birchtown, Que.	J.O.B.	" 20	1·05	·14	Free.	7·0	198·0	132·0	66·0	Trace	Very suspicious.
66	St. Hyacinthe, Que.	M.M.St.J.	Nov. 2	4·17	·38	Free.	1550·0	3760·0	3578·8	181·2	Hy. trace	Saline.
67	Ottawa, Ont.	J.M.P.	" 2	Free.	·20	Free.	8·5	540·4	196·4	344·0	Trace	Suspicious.
68	Windthorst, Sask.	R.H.	" 2	·01	·02	·21	Free.	272·8	216·0	56·8	Free	Free from pollution.
69	Herbert, Sask.	P.M.	" 3	5·27	·77	Free.	75·0	5213·3	4666·0	547·3	Hy. trace	Saline.

70	Birchy Cove, Nfld.	B.M.	Nov.	4	Free.	·01	·07	Free.	89·6	33·6	56·0	Free	Free from contamination.
71	Bertdale, Sask	G.P., No. 1	"	7	·10	·08	Free.	17·0	520·7	376·0	44·7	"	Free from organic pollution.
72	"	" No. 2	"	7	1·40	·07	·16	190·0	2514·7	2309·3	205·4	Sl. trace	Suspicious.
73	Maxville, Ont	Dr D.McE., No. 1	"	7	·77	·36	Free.	24·5	490·0	396·0	94·0	"	Contaminated.
74	"	" No 2	"	7	·10	·60	·57	3·0	68·0	32·0	36·0	Trace	Very suspicious.
75	Priceville, Ont.	D.H.	"	12	·01	·24	Free.	4·5	266·0	96·0	170·0	Free	Free from pollution.
76	Bradford, Ont.	H.E.S.	"	14	Free.	·21	12·9	700·0	2428·0	2114·0	314·0	Sl. trace	Very suspicious.
77	Eldon Station, Que	P.R.McE.	"	18	25·5	22·3	Free.	21000·0	42800·0	30760·0	12040·0	Free	Strongly saline.
78	St. Tite, Que	P.C., No. 1	"	19	·08	6·89	·05	250·0	900·0	530·0	370·0	Hy. trace	Seriously contaminated.
79	"	" No. 2	"	19	6·88	1·05	·83	34·0	277·0	149·0	128·0	"	"
80	St. Alphonse, Man.	H.M.	"	21	1·13	·08	Free.	14·5	2074·0	1658·0	416·0	Free	Polluted.
81	Mansewood, Ont.	Rev. W.L.M.	"	23	2·15	·09	Free.	126·0	664·0	564·0	100·0	Hy. trace	Contaminated.
82	Melton West, Ont.	W.M.	"	23	·33	·01	Free.	46·0	356·0	296·0	60·0	Free	Suspicious.
83	Bowesville, Ont	L.S.M.	"	28	·016	·05	·07	4·6	270·0	187·5	82·5	"	Free from pollution.
84	L'Epiphanie, Que	J.B.T.R.	Dec.	1	·75	·56	Free.	14·8	636·0	490·0	146·0	Hy. traces	Contaminated.
85	St. Tite, Que	J.P.C.	"	5	8·04	1·23	Free.	72·0	339·6	218·0	121·6	"	"
86	Lochiel, Ont.	D.A.McM.	"	7	·04	·07	6·75	106·0	730·8	530·8	200·0	Free	"
87	St. Isidore de Prescott, Ont.	O.A.L., No. 10.	"	8	2·23	·29	Free.	40·0	522·4	....	....	Hy. traces	Seriously contaminated.
88	" "	" No. 15.	"	8	Free.	·17	Free.	16·0	422·0	296·0	126·0	"	Free from contamination.
89	Quill Lake, Sask.	H.S.P., No. 1	"	20	·04	·17	Free.	15·0	1524·4	1186·4	338·0	Free	Saline.
90	" "	" No. 2	"	20	·90	36	Free.	9·5	1170·4	949·6	220·8	"	"
91	Cummings Bridge, Ont.	M.C.	Jan.	11	6·2	·3	1·85	6800·0	10553·2	9963·2	590·0	"	Strongly saline.
92	Bowesville, Ont	L.S.M.	"	25	Free.	·02	·02	2·5	241·2	149·6	91·6	"	Excellent.
93	Aylmer Road, Que.	L.D.S.	"	26	·01	·09	1·68	3·0	87·2	57·2	30·0	"	Probably wholesome.
94	Rose Corner, Ont.	V.B., No. 5.	"	27	1·38	·05	·90	26·5	433·0	327·0	106·0	Sl. traces	Contaminated.
95	"	" No. 8.	"	27	·15	·46	1·59	106·0	641·0	386·5	254·5	Hy. traces	"
96	Gatineau Point, Que.	W.C.E.	"	30	·04	·15	·14	2·0	49·6	10·0	39·6	"	Unpolluted.
97	Rockland, Ont.	"	"	30	·06	·045	1·31	8·5	482·4	396·4	86·0	Free	"
98	St. Hyacinthe, Que.	Sr. P.M.	"	31	·48	·05	Free.	66·0	587·2	400·0	187·2	Trace	Very suspicious.
99	Rockville, N.S.	M.H.H.	Feb.	4	·06	·63	2·24	66·0	233·6	166·0	67·6	Free	Decidedly suspicious.
100	Billings Bridge, Ont.	J.A.H.	"	7	·01	·03	2·19	70·0	436·0	346·0	90·0	"	Suspicious.
101	Renfrew, Ont.	J.B.L.	"	8	·03	·02	·81	4·0	252·0	152·0	100·0	"	Wholesome.
102	St. Isidore de Prescott, Ont.	H.W.R.	"	11	1·78	·28	Free.	190·0	960·0	866·8	93·2	Hy. traces	Very seriously contaminated.
103	Alexandria, Ont	J.McM., No 1	"	15	Free.	·19	14·52	250·0	1130·8	817·6	313·2	Free	" polluted.
104	"	" No. 2	"	15	Free.	·06	2·97	18·0	356·8	300·0	56·8	"	Contaminated.
105	Gloucester, Ont	E.A.H.	"	16	·62	·05	Free.	60·0	345·5	315·5	30·0	"	Very suspicious.
106	St. Dominique, Que	N.N.	"	23	10·7	·164	Free.	4600·0	8420·0	7776·0	644·0	Hy. traces	Seriously polluted.
107	Dalmeny, Ont.	W.A.McC	"	25	·68	·02	2·25	1600·0	3530·4	2406·4	1124·0	Free	Contaminated.
108	Merrivale Road, Ont	J.R.B., No. 1	"	27	Free.	Free.	·64	4·0	192·0	160·0	32·0	"	Free from organic pollution.
109	" "	" No. 2	"	27	Free.	Free.	·07	6·0	298·8	226·8	72·0	Hy. traces	Free from pollution.
110	" "	H.J.R.	"	28	Free.	Free.	5·0	13·0	357·6	289·6	68·0	Free	"
111	Dalmeny, Ont.	W.A.McC.	Mar.	1	·68	·02	2·25	1600·0	3530·4	2406·4	1124·0	"	Suspicious.
112	Chelsea, Que.	D.G.G.	"	6	·01	·06	·06	1·5	85·2	51·2	34·0	"	Excellent.
113	Ottawa, Ont.	Y.M.C.A.	"	7	·002	·14	·14	2·0	58·0	20·8	37·2	"	Wholesome.
114	"	C.E.F.	"	7	·002	·13	·14	1·5	57·6	23·6	34·0	"	"
115	Ste. Rose de Lima, Que.	M.P.R.	"	8	12·94	·31	Free.	1100·0	20144·4	18244·4	1900·0	"	Strongly saline.
116	Lowe Farm, Man.	J.J.A.	"	9	8·0	1·20	Free.	2450·0	5246·6	3546·6	1700·0	"	"
117	Woodroffe, Ont.	R.E.H.	"	10	Free.	·04	1·40	27·5	383·5	283·5	100·0	Hy. traces	Decidedly suspicious.
118	Fassett, Que.	D.L.	"	11	3·52	·48	Free.	3800·0	6518·0	6009·6	508·4	Free	Saline.

ANALYSES OF WELL WATERS, 1910-11.—*Concluded.*

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
119	City View, Ont	S.A., No. 1	Mch. 13	Free.	·04	2·71	10·0	184·0	136·4	47·6	Free	Free from contamination.
120	"	" No. 2	" 13	Free.	·07	1·01	22·0	280·0	196·4	83·6	"	Suspicious.
121	Grondines, Que	J.A.T.	" 21	·89	·10	·19	40·0	515·2	406·0	109·2	"	Contaminated.
122	Notch Hill, B.C	S.J.	" 22	1·58	·15	1·17	4·0	440·0	270·0	170·0	V. s. trace	Probably contaminated.
123	Chatham, N.B.	A.N.McK.	" 22	Free.	·12	Free.	2·5	54·8	26·8	28·0	Free	Free from pollution.
124	Hurdmans Bridge, Ont.	P.H.C.	" 23	1·00	·07	Free.	30·0	574·8	453·2	121·6	V. s. trace	Contaminated.
125	Rockland, Ont.	W.C.E.	" 25	Free.	·07	1·40	8·5	408·0	328·0	80·0	Free	Suspicious.
126	Ottawa South, Ont.	G.E.A.	" 27	Free.	Free.	8·50	10·5	354·4	206·4	148·0	"	Very suspicious.
127	St. Isidore de Prescott, Ont.	J.St.D., No. 5	" 29	2·53	·02	Free.	12·0	435·0	300·5	134·5	Hy. traces	Contaminated.
128	" "	" No. 8	" 29	1·22	Free.	Free.	2·0	486·5	....	....	"	Free from drainage pollution.
129	" "	" No. 9	" 29	Free.	Free.	2·31	30·0	497·0	296·0	201·0	Sl. traces	Contaminated.
130	St. Thomas Lefaivre, Ont.	L.D.	" 31	3·18	·22	Free.	3300·0	5917·6	5480·0	437·6	Free	Saline.

REPORT OF THE DOMINION ENTOMOLOGIST

C. GORDON HEWITT, D.Sc.

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of the work of the Division of Entomology, with an account of certain of the insects whose depredations received our attention and concerning which advice was given during the year ending March 31, 1911.

During the past year, which is the second succeeding the establishment of a separate Division and the re-organization of the work, there has been a very great increase in the executive and administrative work in addition to that carried out in the field. This increase is indicated to a certain extent by the correspondence of the Division, which was more than double that of the previous year; 2,476 letters were received and 3,845 letters were despatched.

The most important step which has been taken in Canada with a view to combating insect and other pests and plant diseases has been the enactment of 'The Destructive Insect and Pest Act.' With the rapid growth of the country, large quantities of trees, plants and other vegetation classed as 'nursery stock' are being brought into Canada annually from all countries of the world. The importation of such vegetation means the introduction into Canada of insects, pests and plant diseases of various kinds, some of which, such as the San José Scale and the Brown-tail and Gipsy moths, have already inflicted enormous losses as a result of their introduction and subsequent spread in the United States and Canada. In view of this danger, it was of the utmost importance that measures should be taken to prevent, so far as it is practicable, not only the further introduction of seriously injurious insects, pests, and plant diseases but also the spread of such insects and other pests already established in the Dominion. The Act and Regulations issued thereunder will be found in the following pages. The action at present taken in virtue of the powers given under the Act may be briefly summarized as: the fumigation with hydrocyanic acid gas at the fumigation stations established at certain ports on the frontier under the San José Scale Act of 1895, of stock liable to be infested with that scale; the inspection of vegetation from Europe, Japan and six of the New England States liable to be infested with the Brown-tail and Gipsy moths and certain other injurious insects; and the carrying on of extermination work in localities where pests, such as the Brown-tail moth and San José Scale are already established.

A new fumigation and inspection station has been erected at Vancouver, B.C., to meet with the increase which is taking place in the amount of nursery stock imported into British Columbia, and to enable us to inspect stock at the port of entry. This inspection is carried on in conjunction with that required by the British Columbia Board of Horticulture and I am pleased to record the satisfactory manner in which the work has been accomplished. A conference with the Provincial Board of

Horticulture at which the Minister of Finance and Agriculture of British Columbia was present, was held in Victoria, B.C., on October 10, 1910, when I explained the workings of the Destructive Insect and Pest Act.

The work against the Brown-tail Moth is described in the succeeding pages. The situation is more serious owing to the increase in the area infested in Nova Scotia, and the invasion of that portion of New Brunswick adjoining the infested region of the State of Maine. The Division has now undertaken, with the co-operation of the Departments of Agriculture in Nova Scotia and New Brunswick, a systematic campaign against the moth and a thorough scout of the infested district is being made. A study of the insect and its parasites is being carried on and I hope to arrange with Dr. L. O. Howard, Entomologist of the United States Department of Agriculture, for the importation of useful parasites.

In order to increase the opportunities for making the work of the Division more useful to the farmers and fruit growers in Canada, arrangements have been made through the willing co-operation of the heads of other Branches of the Department for the receipt of information concerning injurious insects through their crop reports and correspondence. The Dairy and Cold Storage Commissioner, Mr. J. A. Ruddick, is asking for such information concerning the depredations of fruit insects from the reporters of the fruit crop; the Census and Statistics Branch, through the co-operation of Mr. Blue, reports on insects affecting farm crops from the crop reporters of the Branch. The Veterinary Director General, Dr. J. G. Rutherford, has kindly issued to the Veterinary Inspectors of the Branch, a circular which I prepared in reference to obtaining information concerning species of insects affecting live stock. Mr. R. H. Campbell, Superintendent of the Forestry Branch of the Department of the Interior is also obtaining information from his field officers concerning outbreaks of forest insects. This co-operation is certain to result not only in making the work of the Division of value to a larger number of those whose interests are affected by injurious insects, but also in the accumulation of information and material which will be of very great value to us in our investigations. I should like again to express my indebtedness to these officers and also to those of the Provincial Governments for their co-operation and assistance from time to time.

Reference is made in the succeeding pages of this report to those insects whose injuries have been sufficiently serious to merit attention. Large numbers of the commoner insects are received with requests for advice as to their treatment. Attention should be called to the Narcissus Fly in British Columbia, an insect which has been imported on bulbs. The Larch Sawfly and the Spruce Budworm are being studied both in the field and in the laboratory and as these investigations are in progress, brief mention only is made of them. The control of these and other insects by means of their parasites is receiving special attention and it is becoming increasingly evident that in future we shall have to assist nature in re-adjusting the balance which man is constantly upsetting by cultivation and other means.

The following is a brief account of the visits which were made to the various provinces in connection with the work of this Division:—

At the beginning of the year (1910) I was in Nova Scotia in connection with the Brown-tail Moth extermination work, returning to Ottawa on April 6. From June 6 to June 25, I was absent in the United States to inquire into the extent of the danger existing with regard to the introduction of the Brown-tail and Gipsy Moths into Canada, and also to study the methods employed by the Federal and State Governments in combating these insects. The official and other entomologists at the following places were visited and consulted: New York Agricultural Experiment Station, Geneva, N.Y.; Cornell University, Ithaca, N.Y.; Department of Agriculture, Albany, N.Y.; New York where the State Entomologists of New Jersey and Massachusetts were met; Connecticut Agricultural Experimental Station and Yale University, New Haven, Conn.; Rhode Island Agricultural Experiment Station, Kingston, R.I.; Bussey Institution and Harvard University, Cambridge, Mass.; State Forestry Depart-

ment, Boston, Mass.; Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass.; New Hampshire Agricultural Experiment Station, Durham, N.H.; Department of Agriculture, Augusta, Me.; Maine Agricultural Experiment Station, Orono, Me.; Vermont Agricultural Experiment Station, Burlington, Vt. I should like to express again my sincere thanks to those of my fellow-workers whom I met, for their kindness and help. One result of the inquiries made during the visits was the passing of a regulation by Order-in-Council, under the Destructive Insect and Pest Act, providing for the inspection of nursery stock from the States of Vermont, New Hampshire, Maine, Massachusetts, Connecticut and Rhode Island for the Brown-tail and Gipsy Moths.

The annual meeting of the Canadian Horticultural Association at St. Catharines, Ont., was attended on August 11 at the request of the Association to explain the Destructive Insect and Pest Act as affecting the importation of florist stock into Canada. As the result of a consideration of their representations some amendments in the regulations were made to obviate hardships which might otherwise occur.

On September 19 I left Ottawa for the western provinces and British Columbia in connection with the inspection and fumigation work of the Division and to discuss with the provincial Departments of Agriculture means of co-operation in respect of controlling injurious insects and reporting their occurrences, etc. In so wide a country such co-operation is essential and I am convinced that the meetings which I had will help to forward the work. By arrangement with the provincial and civic Medical Officers of Health I lectured in the following cities on the relation of house flies to public health: Winnipeg, Man.; Regina and Saskatoon, Sask.; Edmonton, Alta.; Vancouver, B.C.; and before the Natural History Society of British Columbia in Victoria, B.C. On Vancouver Island, the outbreak of the Spruce Budworm was again investigated, and I travelled as far as Nanaimo. This year I visited the Okanagan Valley and again passed through the Kootenay region. After visiting Lethbridge, Alta., I returned direct to Ottawa, arriving back on October 29.

The annual meeting of the Entomological Society of Ontario was attended on November 3 and 4. Mr. Gibson also attended and accounts of our work were given. On November 28 a public lecture was delivered at Halifax, N.S., on the Tussock and Brown-tail Moths, at the request of the citizens. I addressed the annual meeting of the Nova Scotia Fruit Growers' Association at Windsor, N.S., on November 29 and the annual meeting of the Prince Edward Island Fruit Growers' Association at Charlottetown, P.E.I., on December 1. After visiting Truro and Quebec I addressed the annual meeting of the Quebec Pomological Society at St. Hyacinthe, P.Q., on December 6.

The Canadian Forestry Association convention, which was held at Quebec on January 18 and 20, was attended and I delivered an illustrated lecture on the Spruce Budworm and Larch Sawfly. After the convention I visited the Chicoutimi region to study the outbreak of the Spruce Budworm, and afterwards, on January 31 to February 2, the depredations of the same insect were investigated in the Rouge River in the neighbourhood of St. Jovite and Trembling Mountain, P.Q., on which visit I was accompanied by Mr. G. C. Piché, Chief Forestry Engineer of the Forest Service of Quebec.

Full use has been made of the collections of Canadian insects belonging to the Division, by collectors, teachers and students of entomology in all parts of Canada. Slowly but surely we are arranging and building up the collection. I must again sincerely thank all those specialists in Canada and the United States, especially Dr. Howard and his staff of the Bureau of Entomology, at Washington, D.C., for their oft repeated kindnesses in determining material for us. Many of the injurious insects are being mounted in Riker cases for exhibition purposes and they have already proved of considerable assistance in educational work.

During the summer months, from May to October, with occasional visits in the winter, the work of spraying in keeping in order the orchards of the Indian reserves in British Columbia has been carried on by the Division for the Department of Indian

Affairs. Mr. Tom Wilson has been in charge of the work, and in addition to the actual work in the orchards he visited many of the schools where practical demonstrations on methods of orchard cultivation were given to the children. I am pleased to record the satisfaction that this work is giving, especially to those settlers whose fruit growing was previously jeopardized somewhat by the condition in which many of the neighbouring Indians maintained their orchards. The work is also proving beneficial to the Indians, a number of whose orchards are producing excellent fruit. Its further extension will be of undoubted value to the industry in the province.

I am pleased to have this opportunity afforded me of gratefully acknowledging the help and work of my Chief Assistant, Mr. Arthur Gibson. Mr. R. C. Treherne, B.S.A., and Mr. George E. Sanders, B.S.A., have been appointed as field officers in connection with the Brown-tail Moth inspection and extermination work, which duties they are carrying on in a most satisfatory manner. Of their work and of that of my secretary, Mr. J. A. Letourneau, I wish to express my cordial appreciation.

The war against insect pests becomes annually more serious. No group of animals affects man in so great a variety of ways. Their prevention, eradication and control make increasing demands for a more thorough knowledge of their life histories, habits and natural enemies, which can only be gained by careful study both in the laboratory and in the field. It is becoming more generally realized that methods to prevent and reduce losses entailed by insect attacks must necessarily accompany any system of soil culture, or utilization, whether it be on the farm, in the orchard or in the forest.

I have the honour to be, sir,
Your obedient servant,
C. GORDON HEWITT,
Dominion Entomologist.

DIVISION OF ENTOMOLOGY.

THE DESTRUCTIVE INSECT AND PEST ACT, 1910.

In May, 1910, Parliament passed 'An Act to prevent the introduction or spreading of Insects, Pests and Diseases destructive to vegetation.' The danger of the introduction of injurious insects, pests and plant diseases is probably greater in Canada than in any other country. This is due to the fact that, owing to the rapid development and opening up of the country, a large amount of vegetation of all kinds, trees, shrubs, seedlings, etc., is imported into Canada from countries in various parts of the world. All this vegetation, collectively termed 'nursery stock' is liable to be infested with insects and other pests and diseases which do not occur in Canada. Introduced in this manner, however, in many instances they become established. The seriousness of such an establishing of an introduced insect in a new country is enormously increased by the fact that their means of control in their native country, namely, their native parasites, are not usually brought with them. Their tendency, therefore, is to increase as we see the Gipsy and Brown-tail Moths increasing in the United States. It is estimated that 50 per cent of the insect pests in the United States are introduced insects. In Canada a number of introduced insects have already established themselves and in certain cases have resulted in great losses. The San José Scale, originally introduced into the United States, was first recorded in Canada about 1894; the Brown-tail Moth introduced into the State of Massachusetts about 1890 from Europe, was discovered in Nova Scotia in 1907; the Narcissus Fly, which would appear to be a native of Europe, has been introduced into British Columbia on bulbs from Holland. Numerous other instances of the introduction of injurious insects into Canada and their subsequent spread might be adduced, indicating this danger to which we are exposed.

The introduction of the San José Scale and the previous experience of its destructive powers in the United States were responsible for the passage of the San José Scale Act in 1898, which prohibited the importation of nursery stock from countries in which this scale occurred. In 1901 by an Order-in-Council, fumigation stations were established at six ports through which stock was allowed to enter at certain periods of the year after having been fumigated with hydrocyanic acid gas. Certain classes of stock, not likely to be infested with San José Scale, were exempt from fumigation,

Except for this power to fumigate certain classes of nursery stock at six of the ports of entry, the Federal Government had no authority to take action to prevent the introduction of further insect pests and the spreading of these, or of pests already in Canada. In 1909, winter webs of the Brown-tail Moth were found in Canada and the United States in shipments of nursery stock from France. As this insect had already established itself in Nova Scotia, it was important that the Minister should have the necessary powers to prevent the introduction of the pest into those parts of Canada not already infested. Accordingly, the Destructive Insect and Pest Act was passed, under which regulations could be issued providing for the prohibition of entry, fumigation on entry or inspection subsequent to entry, of nursery stock and defining other conditions under which nursery stock and other vegetation might be introduced into Canada. Regulations were passed by Order-in-Council in virtue of provisions of section 3 of the Act on May 1, and July 27, 1910. These regulations were rescinded by regulations passed by Order-in-Council on February 27, 1911.

The text of the Act and the regulations issued thereunder are as follows:—

THE DESTRUCTIVE INSECT AND PEST ACT.

AN ACT TO PREVENT THE INTRODUCTION OR SPREADING OF INSECTS, PESTS AND DISEASES DESTRUCTIVE TO VEGETATION.

(9-10 Edward VII., Chap. 31, assented to May 4, 1910.)

His Majesty by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. This Act may be cited as *The Destructive Insect and Pest Act.*

2. In this Act, unless the context otherwise requires, 'the Minister' means the 'Minister of Agriculture.'

3. The Governor in Council may make such regulations as are deemed expedient to prevent the introduction or admission into Canada, or the spreading therein, of any insect, pest or disease destructive to vegetation.

4. Such regulations may provide:—

(*a*) for the prohibition generally, or from any particular country or place, of the introduction or admission into Canada of any vegetable or other matter likely to introduce any such insect, pest or disease;

(*b*) the terms or conditions upon, and the places at which any such vegetable or other matter may be introduced or admitted into Canada;

(*c*) for the treatment and manner of treatment to be given to any vegetation, vegetable matter or premises in order to prevent the spreading of any such insect, pest or disease, and may prescribe whether such treatment shall be given by the owner or by a person appointed for such purpose;

(*d*) for the destruction of any crop, tree, bush or other vegetation or vegetable matter or containers thereof infested or suspected to be infested with any such insect, pest or disease;

(*e*) for the granting of compensation for any such crop, tree, bush or other vegetation or containers thereof so destroyed, such compensation not to exceed two-thirds of the value of the matter so destroyed and to be granted only by the Governor in Council upon the recommendation of the Minister.

(*f*) for the prohibition of the sale of any vegetable matter infected with any such insect, pest or disease;

(*g*) that the occupier of the premises on which is discovered any such insect, pest or disease shall forthwith notify the Minister and shall also send specimens of any such insect, pest or disease;

(*h*) for the confiscation of any vegetable matter and the container thereof, if any, in respect of which a breach of this Act, or any regulation made thereunder is committed and generally for any other purpose which may be deemed expedient for carrying out this Act, whether such other regulations are of the kind enumerated in this section or not.

5. The Minister may appoint inspectors and other officers for carrying out this Act and the regulations thereunder.

2. Such appointments, if not confirmed by the Governor in Council within thirty days of the date thereof, shall lapse and cease to be valid.

6. Any inspector or other officer so appointed may enter any place or premises in which he has reason to believe there exists any such insect, pest or disease, and may take specimens thereof and also any vegetable matter infested or suspected of being infested therewith.

7. The Minister, upon the report of any inspector setting forth a reasonable belief of the existence of any such insect, pest or disease in any area defined in such report, may prohibit the removal from such area or the movement therein of any vegetation,

vegetable or other matter which, in his opinion, is likely to result in the spread of such insect, pest or disease.

8. Every person who contravenes any provision of this Act, or any regulation made thereunder, shall be liable, upon summary conviction, to a fine not exceeding one hundred dollars, or to imprisonment for a term not exceeding six months, or to both fine and imprisonment. Any vegetable or other matter imported or brought into Canada contrary to this Act, or to any regulation made thereunder, shall be forfeited to the Crown.

9. Every Order-in-Council and regulation made under this Act shall be published in *The Canada Gazette,* and shall be laid, by the Minister, before Parliament within fifteen days after the commencement of the then next session.

10. *The San José Scale Act* is repealed.

Regulations issued under the Destructive Insect and Pest Act.

(By Order-in-Council of February 27, 1911).

1. 'Inspector' means a person appointed for carrying out the provisions of the Destructive Insect and Pest Act and the regulations made thereunder.

2. No tree, plant or other vegetation or vegetable matter infested with any of the insects, pests or diseases to which this Act applies, shall be imported into Canada, except as hereinafter provided.

3. Nursery stock, including all trees, shrubs, plants, vines, grafts, scions, cuttings or buds which are not hereinafter exempted, entering Canada shall be imported only through the ports and during the periods respectively hereinafter mentioned, that is to say:—

Vancouver, B.C., from October 1 to May 1.

Niagara Falls, Ont., from October 1 to May 15.

Winnipeg, Man., and St. John, N.B., from March 15 to May 15, and from October 7 to December 7.

Windsor, Ont., and St. Johns, P.Q., from March 15 to May 15, and from September 26 to December 7.

At these points of entry, the importations shall be fumigated in the fumigation houses provided for that purpose, and a certificate of fumigation will be issued, without which no stock may be taken out of bond.

Importations by mail shall be subject to the same regulations.

All nursery stock originating in Japan or in any one of the states of Vermont, New Hampshire, Maine, Massachusetts, Connecticut and Rhode Island, six of the United States of America, shall, after fumigation, be subject to inspection as provided by section 6 of these regulations.

Provided, however, that the following vegetation and florist's stock shall be exempt from fumigation and may be imported at any season of the year and through any port without inspection:—

(*a*) Greenhouse-grown plants, including roses in foliage which have been grown in pots up to three inches in diameter but not larger. A certificate that the plants have been grown under glass must accompany the invoice and shall be signed by the consignor.

(*b*) Herbaceous perennials (the stems of which die down in winter) such as perennial phlox, pæonies, sunflowers, etc.

(*c*) Herbaceous bedding plants (such as geraniums, verbenas, pansies, etc.)

(*d*) Bulbs and tubers (such as hyacinths, lilies, narcissi and other true bulbs and also the tubers of dahlias, irises, etc.).

(*e*) Cottonwood or Necklace Poplar (*Populus deltoides*) when shipped from and grown in Dakota or Minnesota, two or the United States of America.

4. The port by which it is intended that the nursery stock shall enter shall be clearly stated on each package, and all shipments made in accordance with these regulations will be entirely at the risk of the shippers or consignees, the government assuming no responsibility whatever.

5. All persons importing nursery stock, except such as is exempt from fumigation or inspection under section 3 of these regulations, shall give notice to the Dominion Entomologist, Experimental Farm, Ottawa, within five days of despatching the order for the same, and they shall again notify the Dominion Entomologist on the arrival of the shipment in Canada.

Notice shall also be given to the Dominion Entomologist by all transportation companies, custom house brokers or other persons importing or bringing into Canada nursery stock that is subject to inspection as hereinafter provided, immediately such a consignment is received by them. Such notice shall include the name of the consignor and the consignee, the points of origin and destination, the name of the company carrying the nursery stock, as well as the nature, quantity and origin of the same.

6. Nursery stock, not including such stock as is exempt under section 3 of these regulations, originating in Europe, shall be imported only through the ports and during the periods specified under section 3 for stock requiring fumigation, with the addition of the ports of Halifax, N.S., Sherbrooke, P.Q., and Montreal, P.Q., through which ports such European stock may enter from September 15 to May 15. Such European nursery stock, and such other imported vegetation as the Minister may determine, entering Canada, shall be exempt from fumigation, but shall be inspected either at the port of entry or at its destination to which it may be allowed to proceed, but in the latter case it must not be unpacked except in the presence of an inspector.

7. If, on inspection, nursery stock or other vegetation or vegetable matter is found to be infested with any of the insects, pests or diseases hereinafter specified, it shall be destroyed to the extent deemed necessary by the inspector and in his presence. All cases, packages, and packing in which such stock has been contained shall also be destroyed in the same manner.

8. Any inspector entering any lands, nursery or other premises where there is reason to believe that any of the insects, pests or diseases hereinafter specified are or may be present, shall give instructions for the treatment or destruction of any tree, bush, crop or other vegetation or vegetable matter or the containers thereof, which may be found or suspected to be infested with any of the insects, pests or diseases hereinafter specified, and such instructions shall be carried out by the owner or the lessee of the infected or suspected vegetation, vegetable matter or containers thereof, and such remedial treatment shall be carried out and continued until the insect, pest or disease shall be deemed by the inspector to have been exterminated.

9. Compensation, not exceeding two-thirds of the value assessed by the inspector, of the vegetation or vegetable matter or containers thereof destroyed by the instructions of an inspector, shall be granted by the Governor in Council upon the recommendation of the Minister.

10. It shall be illegal to sell, offer for sale or in any way dispose of or receive any trees, shrubs or other plants, vegetable matter or portions of the same, if the same are infested with any of the insects, pests or diseases hereinafter specified.

11. The owner, occupier or lessee of any premises or place where any of the insects, pests or diseases specified herein shall be found, shall immediately notify the Minister, and shall also send to him specimens of such insects, pests or diseases.

12. The destructive insects, pests or diseases to which the said Act shall apply shall include the following:—

The San José Scale (*Aspidiotus perniciosus*).
The Brown-tail Moth (*Euproctis chrysorrhœa*).
The Woolly Aphis (*Schizoneura lanigera*).
The West Indian Peach Scale (*Aulacaspis pentagona*).

The Gipsy Moth (*Porthetria dispar*).
Potato Canker (*Chrysophlyctis endobiotica*).
Parasitic diseases affecting potatoes externally or internally.
Branch or Stem Canker (*Nectria ditissima*).
Gooseberry Mildew (*Sphærotheca mors-uvæ*).
White Pine Blister Rust (*Peridermium strobi*).

13. The importation of potatoes into Canada from Newfoundland or the Islands of St. Pierre or Miquelon is prohibited.

14. The Minister may, upon special request to that effect, authorize the importation into Canada of any insect, pest or disease hereinafter specified, but for scientific purposes only.

15. The regulations made under the *San José Scale Act* are repealed.

BROWN-TAIL MOTH.

The work directed against the Brown-tail Moth (*Euproctis chrysorrhœa*) has again comprised the inspection of all shipments of European and certain other classes of imported nursery stock for the winter webs or nests of the insects, and, in addition, the inspection of the areas infested or liable to be infested in Nova Scotia and New Brunswick.

INSPECTION OF IMPORTED NURSERY STOCK.

The inspection of shipments of European nursery stock was concluded at the end of May last (1910), and as it was in progress at the close of the previous fiscal year, it was impossible to report upon it at an earlier date. In eastern Canada over two and a half million plants and trees were examined and 310 winter webs of the Brown-tail Moth were found. They were distributed on the different species of plants as follows:—

Apple	234
Pear	40
Plum	19
Ornamentals	5
Spiraea	5
Cherry	4
Quince	2
Berberis	1

All the infested stock was of French origin and the webs were found in the following proportions on the stock of the different shippers:—

Messrs. Choplin, Maze	165
" L. Courant, Angers	57
" L. LeRoy, Angers	48
" V. LeBreton, Angers	23
" Detrichi, Angers	10
" Colombe, Senault & Huet, Calvados	4
" Andre LeRoy, Angers	3

These figures do not include the stock imported into British Columbia which was inspected by the Inspector of Fruit Pests of the province and his officers.

A letter was sent to each of the above nurserymen calling their attention to the seriously infested nature of their stock, and we understand from them and from Dr. L.

O. Howard, Entomologist of the United States Department of Agriculture, who visited Angers, that efforts are being made by the nurserymen and by the French Government to institute a better system of nursery inspection than has existed hitherto. This inspection in Canada is now being carried on under the Destructive Insect and Pest Act. The scarcity of nests in the French shipments during the present season would indicate either that greater care is being taken by the nurserymen or that the outbreak of the insect in the localities in which the nurseries are located was less severe last season. It is probable that the scarcity of nests is due to both causes.

FIELD INSPECTION IN NOVA SCOTIA.

As in the year following the first discovery of the Brown-tail Moth in Kings County, Nova Scotia, in 1907, Prof. M. Cumming, Secretary for Agriculture for the province arranged for the inspection of the infested regions, and the destruction of the winter webs was carried on by Messrs. H. G. Payne and H. R. Brown. Their work was supplemented by Mr. G. H. Vroom, Dominion Fruit Inspector. Their work was confined to a careful survey of the orchards and adjoining wild thickets, and the collection of the winter webs. Altogether 1,484 winter webs were destroyed, which is an increase over the number destroyed in 1909, when over 800 nests were destroyed.

The following list of localities and numbers of winter webs which were destroyed in the same, which has been supplied by Mr. Vroom, indicates the degree of infestation in the different localities in the years 1909-1910.

Bridgetown	344
Deep Brook	417
Bear River	390
Nictaux	235
Middleton	40
Smith's Cove	24
Laurencetown	16
Paradise	8
Clements Port	5
Round Hill	3
Lequille	2
Total	1,484

It will be seen from the above that the region which was inspected during the winter of 1909-10, was about 50 miles in extent. Mr. Vroom reported that the webs were larger and contained more caterpillars than those collected during the previous winter. The presence of a large number of webs at Nictaux indicates an increase in that region where only two or three webs had been obtained previously.

During the past year the Federal Department of Agriculture took over the responsibility for the conduct of the Brown-tail Moth extermination work in the province with the co-operation of the Provincial Department of Agriculture who are continuing, in co-operation with our officers, work of the same extent as in the previous year. The federal and provincial officers are working together under our direction and are divided into two parties: a western party commenced work in the vicinity of Yarmouth and is working eastwards and an eastern party commenced work at Windsor, and is working westwards to meet the other party in the most thickly infested region.

The reports up to date indicate that the situation is more serious this year. Scattered winter webs have been found between Yarmouth and Weymouth and in the vicinity of Weymouth more nests have been found than in any single vicinity pre-

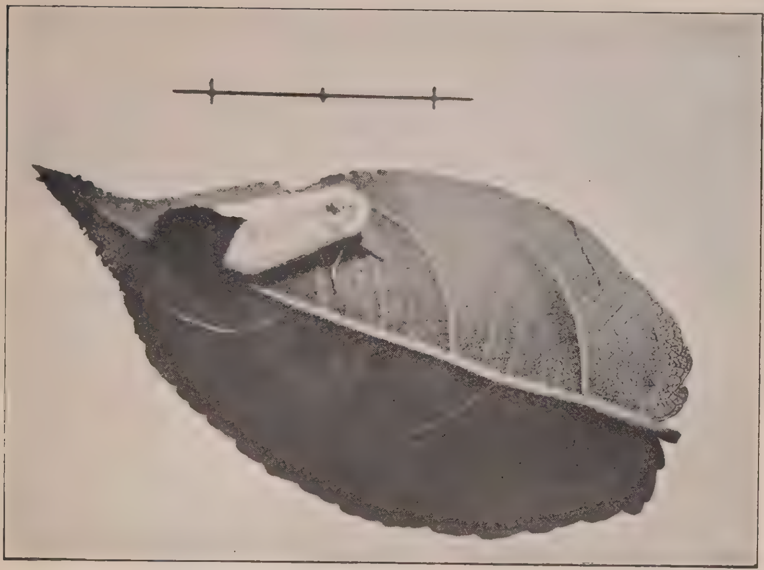


Fig. 4. Female Brown-tail Moth (*E. chrysorrhoea L.*) depositing egg-mass on underside of apple leaf. (Slightly enlarged).

Fig. 5. Full grown caterpillar of Brown-tail Moth (natural size).

(*Photos by H. T. Güssow.*)

FIG. 6. Winter webs or nests of the Brown-tail Moth collected in Nova Scotia. Note the characteristic white silken attachment to the twig.

Photos by H. T. Güssow.

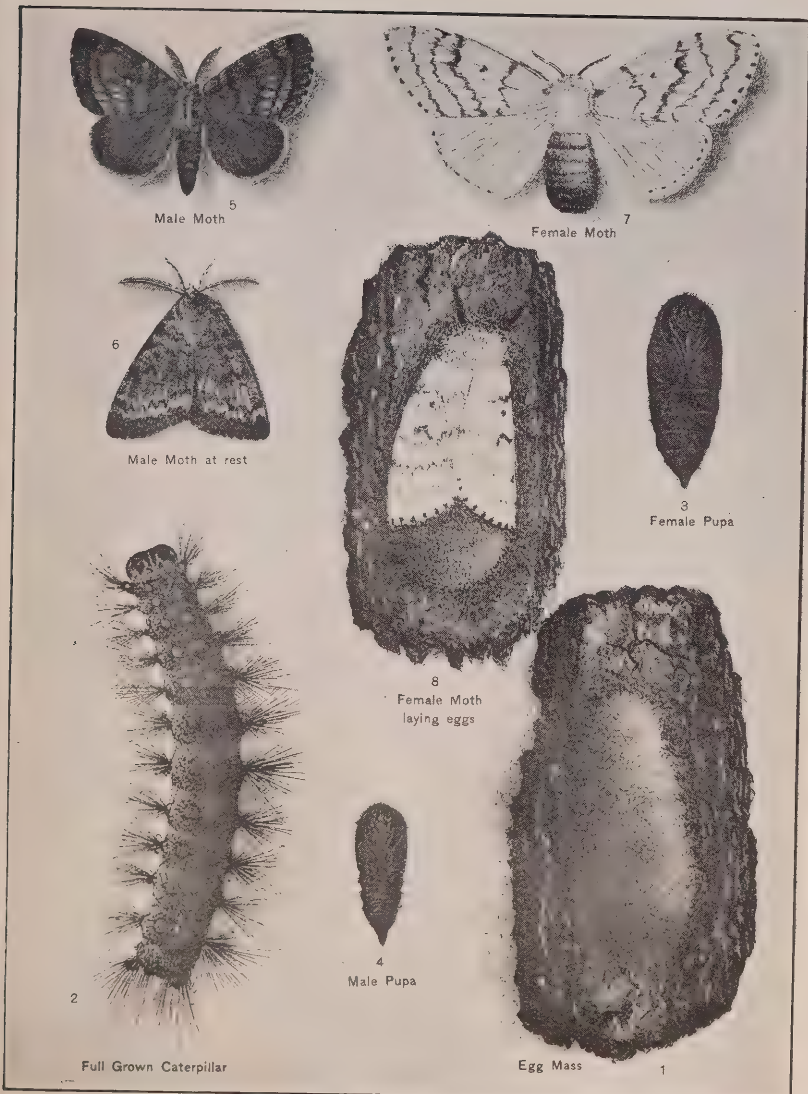


FIG. 7. The Gipsy Moth, *(Porthetria dispar L.)* the different stages of its life-history. Natural size. *(This illustration is from a coloured card circular issued by the State Forester of Massachusetts.)*

viously. This is due to the fact that the vicinity was not inspected last season and a few winter webs were found there in 1909. The importance of making this thorough and systematic inspection is indicated by the fact that some of the wnter webs, which might be left were the inspection not thorough, have been found to contain an abnormally large number of caterpillars. One web was found to contain as many as 1,785 young caterpillars. Most of these winter webs are found on apple trees in small orchards and especially in trees near to the windows of houses. Observations in the field indicate the extent to which the lights from the windows serve to attract the night-flying female moths.

There is no doubt that the chief manner in which the Brown-tail Moth has been introduced into Nova Scotia has been by means of small vessels trading between Boston and other New England ports, where the insect is so abundant, and the small ports of Weymouth, Bear River and Bridgetown. On investigation I found at these points all the conditions necessary for a successful landing in the port of the caterpillars and moths. Wild apple and thorn, on both of which the caterpillars feed, occur in close proximity to the wharves where the vessels are unloaded and where any goods upon which caterpillars had been carried across the Bay of Fundy, would lie. The absence of any serious outbreak at Yarmouth is explained probably by the entire absence of these trees near the wharves. But where trees are near the wharves as is the case at Weymouth, Bear River and Bridgetown, there we have discovered heavy infestations of the caterpillars. In other cases the moths may be transported across from the New England States, either on vessels or by the wind. That the latter method of dispersal is not improbable is shown by the fact that male specimens of the Brown-tail Moth have been captured on the coast and inland near lights in Yarmouth County. In one case a nest was found on a tree in front of the window of a farm house some distance from the coast. During the flying period the light from the windows illuminated this tree and no doubt a female moth was attracted on this account and deposited her eggs. Other instances were found of the influence of lights attracting the female moths in flight to trees situated near to windows habitually illuminated during the flying period. This flying period commences about the second week of July.

INSPECTION IN NEW BRUNSWICK.

Owing to the fact that the Brown-tail Moth had extended along the coast of the State of Maine as far as the international boundary, the St. Croix River, and had been recorded at Princeton, Maine, it was considered necessary to have the southeastern region of the province of New Brunswick carefully examined for signs of the insect's invasion. Mr. W. McIntosh in previous years has taken moths at lights in St. John, N.B., but no traces of the insect having established itself in the province had been discovered by the investigations which Mr. McIntosh had made on behalf of the provincial government. Accordingly, two of our field officers, Messrs. G. E. Sanders, and R. C. Treherne, were sent to that region at the beginning of June and a careful survey was made, lasting to the end of October, of the south-eastern region of the province which was most likely to be infested. They also visited Grand Manan and other islands and during the flying season light traps were employed but with little success. Mr. Wm. McIntosh reported the taking of moths at light from July 6 to 16th and males were received from the light house on Grand Manan on August 2. The first evidence of the moth breeding in New Brunswick was a single egg mass sent to the Division on August 15, 1910, by Mr. W. S. Poole, St. Stephen, N.B., who found it on an apple tree about two miles inland from the frontier. From this egg mass we reared eight specimens of the small hymenopterous egg parasite *Pentarthrum minutum* Riley (*Syn. Trichogramma pretiosa*) which emerged on August 24 and were kindly identified for us by Mr. A. A. Girault. The hostile reception which the Brown-tail Moth thereby appeared to be receiving was of interest. Beyond this discovery no fur-

ther evidence of the insect having established itself in the province could be discovered at that time. On March 21, 1910, however, Mr. W. W. Hubbard, Secretary for Agriculture for New Brunswick, reported the discovery of a single nest of the Brown-tail Moth found by Mr. Fred McInnis at Pomeroy Ridge, Charlotte County.

A few days later an inspection by Mr. Wm. McIntosh of the Provincial Department of Agriculture, resulted in the discovery of 34 nests, indicating that the insect

FIG. 1. Distribution of the Brown-tail and Gipsy Moths in the United States and Canada in 1910.

has now established itself in the province. Our officer, Mr. G. E. Sanders, was immediately sent to the district to make a thorough inspection assisted by an officer of the Provincial Department of Agriculture.

The history of the Brown-tail Moth in Canada is briefly as follows:—

1902. Mr. Wm. McIntosh of St. John, New Brunswick, took a single male specimen about 20 miles from St. John, N.B. Mr. G. Leavitt also took one.

1905. In July, Mr. John Russell took a specimen of the Moth at Digby, Nova Scotia.

1907. A single winter web was received by the Division from Mr. C. P. Foote, Lakeville, Kings County, Nova Scotia. Immediate investigation revealed the presence of several thousand webs in Annapolis and Kings Counties.

1909. Winter webs containing living caterpillars were found in shipments of seedling nursery stock imported into Ontario, Quebec and British Columbia, from France, as a result of the inspection of these shipments.

1910. A single egg mass received in August, from St. Stephen, New Brunswick.

1911. Winter webs discovered at Pomeroy Ridge, Charlotte County, N.B., being conclusive evidence of the establishment of the insect in New Brunswick. The infestation in Nova Scotia also discovered to be greater.

The life history and habits of the Brown-tail Moth have been described in previous reports of the Division (1906 and 1909). By the distribution of these reports, by public lectures and communications to the press, the public are becoming acquainted with the facts and the nature of the serious results which would follow the firm establishment of the pest in Canada. The financial loss alone would be enormous. We have the experience of the New England States in fighting the Gipsy and Brown-tail Moths to indicate the importance and necessity of taking every possible means, no matter what it may cost, to maintain control of, if not to eradicate, this pest while we are able, as I am convinced we are at present. Some idea of the amount which has been expended in the State of Massachusetts alone on the work of preventing the spread of the Gipsy and Brown-tail Moths may be gathered from the following figures. The work was commenced in 1890, and continued until 1900, during which period the total expenditure amounted to $1,175,000. In 1900, the work was discontinued at a time when control was being obtained and the spread was being prevented. Owing to this most serious mistake, both of the moths spread rapidly and in 1905, the State was compelled to undertake the work of preventing the spread, but now on a far larger scale as may be judged from the expenditure. The State of Massachusetts has expended from May, 1905, to January, 1910, the sum of $5,500,000, and the Federal Government has expended $417,763.84, making the enormous total of $5,917,763.84. This does not include the amounts spent by corporations and individuals in fighting the insect. I am informed by Mr. F. W. Rane, State Forester of Massachusetts that over $1,000,000 is being expended annually in that state in the fight against the Gipsy and Brown-tail Moths.

EFFECT OF TEMPERATURE ON THE BROWN-TAIL MOTH.

Two factors will govern the distribution of the Brown-tail Moth in Canada: the coniferous forests and the minimum temperature. Unlike the Gipsy Moth, the Brown-tail Moth does not feed upon coniferous trees and therefore the presence of these trees in a pure condition will limit the distribution of this species of moth.

The limiting power of a minimum temperature, however, is an extremely important one to take into account in considering the possible distribution of the Brown-tail Moth in Canada, where in certain regions an extremely low temperature may be maintained for some length of time. For this reason, therefore, the experiments of Grevillius* are of very great interest and importance. He carried out with the aid of various freezing mixtures by means of which very low temperatures could be produced, a large series of experiments on the effect of low temperatures on the hibernat-

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* Grevillius, A. Y. 'Zur Kenntnis der Biologie des Goldafters (*Euproctis chrysorrhœa* L. Hb) und der durch denselben verursachten Beschädigungen' *Botanische Centralbl.* Vol. 38, Abt. II., pp. 222-322, 8 figs. 1905.

ing larvæ in the nests. It was found that the larvæ in rather small nests were killed by exposure for a short time to a temperature of —30 degrees C. (equals —22 degrees F.) In larger nests containing about 120 to 350 larvæ, all the larvæ were killed with a minimum temperature of —35 degrees C. (equals —31 degrees F.). Many of the winter webs found in Nova Scotia are considerably larger than those used by Grevillius in his experiments and a much lower temperature would, therefore, be needed to kill all the larvæ contained in such large nests. Sanderson* has studied the effects of a low temperature on the mortality of the larvæ of the Brown-tail Moth in Maine and New Hampshire. He found that in the case of average-sized nests containing 300 or 400 larvæ, 72 per cent to 100 per cent of the larvæ were killed by a minimum temperature of—24 degrees F. or lower, a less percentage being killed in the case of larger nests. Grevillius records the interesting fact that at Kasan, which is the northern limit of the Brown-tail Moth in Russia, the mean annual minimum temperature is about—26 degrees F. which is practically the same temperature as that which his experiments indicated as being the lowest at which the larvæ could exist.

Although these experiments and observations would appear to indicate the possibility of predicting the approximate distribution of the Brown-tail Moth in eastern Canada, there are other factors governing the distribution which prevent the attainment of positive conclusions from a study of the minimum isotherms alone.

THE GIPSY MOTH (*Porthetria dispar L.*)

This insect has not yet reached Canada, but as it is spreading northward through the State of Maine and is slowly approaching the frontier, it is of the greatest importance that its appearance in the various stages should be known in Canada. It is liable to be carried in many ways. The caterpillars may the transported on freight and other goods shipped into Canada by railroad or boat from the infested region which is shown in the accompanying map. They are also carried on vehicles. The egg masses also may be transported on goods, especially on lumber. The various stages in the life-history of the insect are illustrated herewith. (This illustration is from one published and distributed by the State Forester of Massachusetts).

The eggs are deposited in yellowish or light-brown felt-like masses which are about three-quarters of an inch long. They are usually deposited on the trunks of the trees and in crevices, but they may also be found in all kinds of situations: on buildings, on fences and lumber, in boxes and among rubbish. The eggs hatch about the beginning of May and the caterpillars immediately begin to feed. They feed on the foliage of practically all trees, orchard, shade and forest trees and shrubs. As defoliating insects they are more serious than the Brown-tail Moth owing to the fact that they strip coniferous trees which are killed by repeated defoliation. They will also attack garden and field crops and even grass. As the caterpillars become larger they feed at night, hiding in clusters during the day in crevices, etc. By the beginning of July the caterpillars are usually full-grown. The full-grown caterpillar is from two to three inches in length, dark-brown or greyish in colour with two rows (four pairs) of blue spots succeeded by two rows (six pairs) of red spots along the back. The body is provided with tufts of long hairs. They pupate in those situations in which the egg masses are found and also in the foliage.

The moths emerge about the end of July or beginning of August, according to the locality and season. The male moth is yellowish brown or light brown in colour, having the fore wings banded with wavy darker brown bands, as shown in the illustration. It measures about one and a half inches across the wings. The antennæ are feather-like. The female moth is almost white in colour. The fore wings are banded with four wavy dark lines and there is a series of black dots around the outer margin of both pairs of wings. The wing expanse is about two and a quarter inches. As the

*Sanderson, E. D. 'The influence of minimum temperatures in limiting the Northern Distribution of Insects.' *Jour. Econ. Entom.* Vol. I., pp. 245-262, 7 maps, 1908.

female is very heavily bodied, she does not fly but deposits the eggs to the number of about five hundred in the characteristic felt-like masses.

The young caterpillars are destroyed by spraying the trees with an arsenical poison; lead arsenate is the usual poison employed. When the larvæ are older they are more difficult to kill; advantage is taken of the fact that they descend the trees in the early morning to shelter during the day. On ascending the trees they are caught either by means of a strip of folded burlap or a band of 'tanglefoot' or other sticky substance around the tree. Probably the most effective method of destroying this pest is the destruction of the egg masses, which can be accomplished any time from the end of August to the middle of April. They are easily seen and usually accessible and are destroyed by the application of a dab of creosote. This can be done by means of a small stiff-bristled brush.

Most careful watch should be kept for this species and any suspected insects should be immediately mailed to the Division of Entomology for identification. Those regions which are specially liable to become infested with the Gipsy Moth are the regions already infested with the Brown-tail Moth, namely, those parts of New Brunswick, adjoining the State of Maine and the maritime regions of Nova Scotia, especially where there is any communication with the ports of Massachusetts and southern Maine.

FUMIGATION WITH HYDROCYANIC ACID GAS.

During the year a number of cases have occurred where buildings such as houses, warehouses and mills required fumigation for insects. When general infestations of certain insects occur in buildings, fumigation with hydrocyanic acid gas is the most effective mode of eradication. In many of our Canadian flour mills very serious losses are incurred by the presence of the Mediterannean Flour Moth, *Ephestia kuehniella* Zell, which may also occur in warehouses. We have also received specimens of the larvæ of the Spider Beetle (*Ptinus fur L.*) from flour mills in Manitoba and Saskatchewan. These and other mill infesting insects, but not all species, can be destroyed successfully by fumigation. Occasionally houses may become seriously infested with a species of insect which it may be desirable to eradicate: such eradication can be effected only by fumigation.

Fumigation is effected by hydrocyanic acid gas which is generated in the building. *This gas is one of the most deadly poisons existing and consequently the greatest care must be taken in carrying out these fumigation operations, otherwise the results may be fatal.*

Before fumigating a building, all the openings to the exterior, except the door, must be sealed up. Cracks and crevices may be filled with wet paper or covered with strips of paper and the room or rooms made gas-tight. Provision must be made for the ventilation of the room or rooms from the outside after fumigation. All moist foods and liquids should be removed before fumigation or they may take up the poison. Where mills are to be fumigated they should be thoroughly cleaned previous to fumigation. The cubical contents of the space to be fumigated must be calculated by multiplying the height of the chamber or room by the length and this by the breadth; this will give the number of cubic feet.

The gas is generated by adding dilute sulphuric acid to potassium cyanide. In practice this is reversed. The proportion of the chemicals are as follows for every 100 cubic feet of space:—

Potassium cyanide	1 oz. by weight.
Commercial sulphuric acid	1 " "
Water.	2 fluid ozs. by measure.

The potassium cyanide must be 98 per cent pure. The sulphuric acid should be concentrated, having a specific gravity of 66 degrees Beaume. If the building is poorly

constructed it will be necessary to double the quantities for each 100 cubic feet. The most convenient method of generating gas is as follows: Supposing the chamber to be fumigated is 20 feet long, by 20 feet broad and 10 feet high, the cubic capacity would be 4,000 cubic feet. As each 100 cubic feet requires one ounce of potassium cyanide and the remaining chemicals in equivalent proportion, we should require 40 ounces of potassium cyanide, 40 ounces of commercial sulphuric acid and 80 fluid ounces of water (4 pints). Two deep, fairly wide-mouthed earthenware vessels will be required. Into each pour forty ounces of water and slowly add 20 ounces of the commercial sulphuric acid. The potassium cyanide should be divided into two equal parts of 20 ounces each; each part to be wrapped in thin paper. All is now ready for the generation of the gas, if the chamber has been securely sealed. Stand each of the generating jars containing the dilute sulphuric acid on the floor on several sheets of paper to prevent any injury should the acid splash over. As quickly as possible drop the cyanide tied up in this paper into the jars; the one farthest from the door should be dropped in first and the next immediately after so that the door may be reached before much of the gas has been generated. The door should then be tightly closed and sealed for three or four hours, or, if possible, overnight. The greatest care must be taken that no person enters the room until it has been thoroughly ventilated after the fumigation is complete. After fumigation the ventilators should be opened from the outside, as provided and the room must be thoroughly ventilated for at least one hour before it is entered. A single person should not carry on these fumigation operations or an accident might prove fatal.

It is not advisable to fumigate one room of a house only. The gas is lighter than air and very permeable, in consequence of which it would penetrate other rooms and have serious effects. It is always advisable to fumigate the whole house in case of

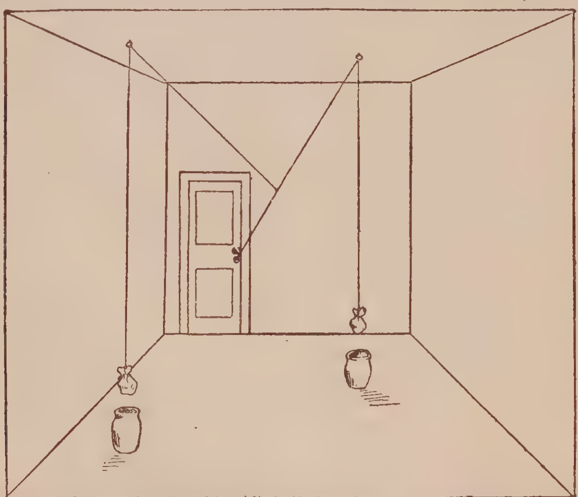

Fig. 2. Diagram illustrating method of stringing a room for fumigation with hydrocyanic acid gas.

serious infestations, beginning with the upper rooms, as the gas is light. Notices should be given to those in adjoining houses and others who might be affected by the gas, and a person should remain outside while the operation is being carried on. Too many precautions cannot be taken in using a gas of the fatal and powerful nature of hydrocyanic acid gas.

In most cases it would be more convenient and considerably safer to arrange for the dropping of the cyanide into the sulphuric acid to be controlled from the outside. This can be done as shown in the illustration. The cyanide wrapped up in thin paper is suspended over the dilute sulphuric acid in the generating jar by means of a string. This string passes through a ring in the ceiling immediately over the jar and is controlled through a small hole in the door. In this manner the cyanide may be lowered into the generating jar after having sealed up the door. By the use of additional rings and strings any number of jars may be used according to the size of the chamber to be fumigated. In the case of large rooms, greenhouses and mills, where several jars are required, this practice should always be followed. It is not advisable to use more than 1½ to 2 lbs. of cyanide to each jar. After the room or building has been ventilated care should be taken in the disposal of the chemicals remaining in the generators which should be most carefully cleaned out and the contents buried or thrown into a sewer. Fumigation with hydrocyanic acid gas will kill the adults and larvæ of many of the insect pests, but it will not destroy the eggs nor all the chrysalids of the moths. In order, therefore, to prevent a reinfestation by the hatching out of eggs or the emergence of moths from the chrysalids which have survived the fumigating process, it will be necessary to fumigate a second time about three weeks later.

Some interesting experiments have been recently carried on by Prof. R. Harcourt* of the Ontario Agricultural College, Guelph, on the effect of mill fumigants on flour and the results are of practical importance. Carbon bisulphide, which is sometimes used as a fumigating agent, has a very marked injurious effect on both wheat and flour. It was found that bread made from flour which had been fumigated with carbon-bisulphide in the usual proportions did not rise well and had a poor colour and texture. On the other hand, fumigation with hydrocyanic acid gas did not affect in the least the baking qualities of the flour, in fact, Prof. Harcourt stated, it would almost seem to have improved the flour.

INSECTS AFFECTING LIVE STOCK.

In the western provinces, horses and cattle are affected to no small degree by various species of biting flies, popularly known as 'Horse Flies' or 'Gad Flies,' most of which belong to the classes of two-winged flies known as the *Tabanidae*, and the *Chrysopidae* which include the smaller biting flies with banded wings. These insects inflict very painful bites upon horses, cattle and other animals, including man. The larvæ are carnivorous and live in water or moist earth. Correspondents have asked if there are no means of protecting horses, etc., from the bites of these and other flies such as the Black Flies (*Simulium* spp.). Many solutions having a repellant odour have been used for this purpose with varying success. The chief difficulty is that the repellent is not effective for long and when such repellents are used they must be applied about twice a day. A solution of oil of tar has been found to be as effective as most of the repellents and it is made as follows:—

A quantity of coal tar is placed in the bottom of a large shallow receptacle and a small quantity of oil of tar or oil of turpentine is stirred in. The vessel is then filled with water which is left standing for several days until it is well impregnated with the odour. The animals are then washed with this as often as may be deemed necessary.

THE WARBLE FLY (*Hypoderma lineata* Villiers).

Throughout Canada 'warbles' occur on cattle. From reports received they appear to be very abundant in the western provinces of Manitoba, Saskatchewan and Alberta, and the losses which result from their occurrence are an

* *Thirty-sixth Annual Report of the Ontario Agricultural College and Experimental Farm*, 1910 (Toronto) pp. 87-92, 1911.

enormous tax on farmers, stock raisers and tanners. Their presence entails the following: loss of flesh in beef and milk cattle, reduction in the milk producing power and other strains on dairy cows and very great loss in the manufacture of the hides owing to the presence in them of the holes made by the maggots. I am informed that it is customary to deduct two dollars from the value of every steer on account of warbles. Thirty years ago it was estimated that the annual loss in the United States caused by the warble fly was about ninety million dollars. Yearlings and heifers suffer most from the attacks of this insect. It is undoubtedly one of the most serious insect pests attacking cattle and at the same time one that is difficult to control. The 'warbles' are tumours caused by the larvae or 'maggots' of the warble fly. The larva sets up irritation beneath the skin with the consequent production of pus and blood upon which it feeds. The warble flies are abundant during the summer and fly in the fields from June to the end of August. They are about half an inch long and covered with hairs like a bumble bee, the hairs being black, white and yellow or reddish brown. They fly in the bright sunshine but do not bite or sting which makes all the more remarkable the fact that their presence will cause cattle to stampede and rush wildly about. The eggs are laid on the hairs of the animals by the fly during the summer and are firmly attached to the hairs. It is believed that most of the eggs are laid on the legs and heels of the cattle and rarely on the backs and sides. How the maggot reaches its final position beneath the skin has not been determined with certainty. It may either bore straight into the skin or it may be licked into the mouth and from there work its way through the tissues to reach its final position beneath the skin. Prof. Carpenter, of Dublin, Ireland, who for six years has been conducting experiments on this insect and its method of control * has found young maggots imbedded in the tissues of the gullet of young cattle slaughtered in August and October. Strose† has found that in the case of *Hypoderma bovis*, which probably does not occur in North America, some of the larvæ probably enter the body through the skin. He also found that the full-grown larvæ leave the host chiefly during the night and early morning. By whatever way the maggots gain entrance they finally arrive beneath the skin on the backs of the animals about February and then give rise to the 'warbles.' When the maggots are wandering through the tissues before reaching the back they are smooth but having arrived beneath the hide they moult and become spiny. A hole is now made in the warble through which the maggot breathes by means of two openings or spiracles at its tail end. The maggot becomes full grown about the end of April or beginning of May (in Eastern Canada) being now about an inch long. The 'ripe' maggot works its way out of the warble and falls to the ground where its skin hardens to form a brownish black case or puparium from which the fly escapes in about four to six weeks.

Remedial Measures.—It was formerly thought, and the belief is still widely prevalent, that the flies could be deterred from depositing their eggs on the backs of cattle if various dips and smears were applied during the summer months. Prof. Carpenter's investigations have shown that no reliance can be placed on such supposed preventives. Nevertheless there is much evidence to show that the systematic destruction of the maggots in the spring before they leave the warbles is productive of very beneficial results. It will be readily understood, that if the maggots are thus destroyed in all the herds throughout a whole district, the number of warble flies will be considerably reduced. Co-operation is necessary. In Denmark ||, this method has been adopted with considerable success and co-operation in the systematic destruction of the maggots has resulted in a marked decrease in the prevalence of warbles in those districts in which the work has been carried on. There is no doubt that, if this work

* *Journ. Dept. Techn. Instr., Ireland*, Vol. 8, pp. 227-246, Vol. 9, pp. 465-476 & Vol. 10, pp. 642-650 (1910).

† *Arb. K. Gesundheitsamt*, Vol. 34, pp. 41-78 & figs. 1910.

|| *Bulletin de la Société Nationale d'Agriculture*, Nos. 3 & 6, 1910.

is thoroughly done, the warbles in any given locality can be reduced to harmless proportions. Further, by the employment of a special man, the cost has been shown to be very small, in Denmark from two to five cents per head.

The best method of destroying the maggots is that of squeezing them out of the warbles which can be easily done when they are ripe. The first examination and destruction should take place in April, and two others in May and June respectively. If the skin is hard it may be softened by washing with a solution of salt and water, using half a pound of salt to three gallons of water. The maggots may also be destroyed by smearing the warbles with a mixture of equal parts of kerosene and pine tar carefully mixed. This mixture fills up the breathing pores of the maggot which dies in consequence. This method, however, is to be less recommended than that of squeezing out the maggots, and it should not be confused with the summer smearing of the backs of the cattle which was formerly recommended, but which has been shown to be useless as a preventive. Wherever it is possible cattle should be allowed to have access to shade trees and water in the summer as the warble flies dislike water and are most active in bright sunshine.

TICKS ON HORSES.

In the spring of 1910, and again in the present year (1911) specimens of ticks were received which Dr. Nathan Banks kindly identified for me as *Dermacentor albipictus* Packard. Mr. G. E. Parham of Penticton, B.C., found them on horses. Through the co-operation of the Veterinary Director General of this Department, further specimens were received from Mr. Ransom, of Vancouver, B.C., who took them from a horse in quarantine at Huntingdon, B.C. This horse had been imported from Elgin, Oregon, and had been running wild all winter. Dr. A. E. Moore, of the Veterinary Branch, also brought specimens obtained from elks imported into Quebec from Wyoming, U.S.A. A study of the life history of this species was begun in 1910, but the records unfortunately were lost. Egg laying commenced at the end of April, and single females deposited from 3,000 to 5,000 eggs during the succeeding months of May and June. These eggs were deposited in the characteristic manner and began to hatch early in July. The young six-legged 'seed ticks' soon climbed up the leaves of grass and collected in large numbers on the tips of the leaves awaiting an opportunity to reach the hairs of the host. When they reach the host such as a horse or elk they crawl over the hair and attach themselves to such a place as the inside of the thighs. Here they moult and now have eight legs. The males are more active than the females which, after mating, increase in size and drop to the ground to deposit their eggs. This species occurs throughout the northern parts of the United States where it has been found on cattle, horses and certain wild animals such as the elk, upon which it is common, and the moose. It has also been found on the beaver.

Two methods of eradication are possible, namely, the destruction of the ticks on the host and in the pasture. They may be destroyed in the pasture either by excluding the horses and cattle for a certain length of time, thus starving out the ticks, this method being called the rotation method, or by allowing the horses to have access to the infested pastures and afterwards destroying the ticks upon the hosts by treating them with certain washes or dips. For the destruction of the ticks upon the host the United States Department of Agriculture* as the result of a long series of experiments recommended an emulsion of crude petroleum made according to the following formula:—

Hard soap	1 lb.
Soft water	1 gallon.
Beaumont crude petroleum	4 gallons.

* U.S. Dept. Agric. Farmers Bulletin No. 378. 1909.

This makes 5 gallons of 80 per cent. emulsion. The soap should be cut up and dissolved in the requisite amount of water by boiling, adding water to make up for that which is lost by evaporation. The soap solution and oil are mixed thoroughly to form an emulsion. This stock solution will keep, and for use a 25 per cent solution should be made by using one part of the stock solution to 2½ parts of water. Beaumont oil is recommended as being less injurious than the heavier varieties of oil, and not so volatile as the lighter oils. Cattle should be sprayed with a 20 to 25 per cent. emulsion every fortnight. Every part of the animal, especially the inside of the thighs and elbows and dewlap should be thoroughly sprayed. Horses should be freed by picking. Certain species of ticks carry organisms of serious diseases, as for example the tick *Margaropus annulatus* of the southern United States, which is the carrier of the organism causing the dangerous Texas Fever. Redwater Fever is also transmitted by ticks.

THRIPS ATTACKING CEREALS.

During the last few years frequent inquiries have been made in reference to the 'blighted' appearance of the heads of oats and wheat and a number of samples of the injured plants were received. Oats were chiefly attacked with the production of the characteristic 'silver top' or 'white top' appearance. Most of the reports of injury were received from Alberta and Saskatchewan. One correspondent from Vancouver Island, B.C., stated that over 50 per cent of a fourteen acre field of oats were attacked. On heads of oats received from Saskatchewan from fifty to seventy per cent of the ears were destroyed and had the typical bleached appearance. Mr. A. Mackay, the Superintendent of the Experimental Farm at Indian Head, Sask., informs me that he has noticed the 'silver-top' on oats for several years, but especially during the last year or two.

We were unable to obtain specimens of the insects from most of the samples as they were dry on arrival here, owing to the long journey and the few insects obtained were too dessicated to make their identification possible. This species may be the Grass Thrips (*Anaphothrips striatus* Osborn), and Mr. F. M. Webster, of the United States Bureau of Entomology showed me a record which he had of this species attacking oats. The Grass Thrips produces 'white' or 'silver top' in a number of grasses, especially in Kentucky Blue Grass (*Poa pratensis*). Dr. Fletcher recorded the occurrence of 'white top' in 1888 and 1892 in *P. pratensis* and also in Timothy (*Phleum pratense*) and Couch Grass (*Triticum repens*). 'White top' in wheat is usually caused by the work of the Wheat-stem Maggot (*Meromyza americana* Fitch), but the specimens of white top in wheat which we received were undoubtedly caused by thrips.

Other species attacking oats are *Æolothrips fasciatus* L. (which also attacks wheat, grasses and weeds) and *Limothrips cerealium* Hal. It is not unlikely that these species occur in Canada.

These insects are minute and in consequence generally escape observation. The Grass Thrips (*A. striatus*) measures about one-sixteenth of an inch in length and is yellow or brownish yellow in colour. The adults are provided with four narrow wings fringed with long hairs and are very active. There is, however, considerable variation in the possession of wings and in the condition of the same in this peculiar family of insects. Their mouth parts are adapted for both sucking and biting, but they appear to take most of their food by sucking the juices of the plants. According to Hinds* the life history is briefly as follows: The females continue to deposit their eggs on the leaves of the grass and the young develop through the fall until the snow covers the ground. The adults hibernate and appear to be able to withstand exposure to tempera-

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* Hinds, W. E., 'Contribution to a Monograph of the insects of the order Thysanoptera inhabiting North America.' *Proc. U.S. Nat. Mus.* Vol. 26, pp. 79-242, 11 pls, 1902.

ture of -21 degrees F. The females become active in the spring, probably as soon as the snow disappears and the eggs then begin to develop. The length of the egg state in the spring is from ten to fifteen days and in the summer from four to seven days. The larvæ are similar in general form to the adults. The length of the larval stage varies from two weeks in the early spring to about four days in midsummer. The first winged adults appear in May or June. The whole life cycle occupies from twelve to thirty days.

Korolikoff* has recently investigated several species of thrips injurious to cereals and grasses in Russia in the neighbourhood of Moscow. He found that the insects passed the winter in the green, soft tissues in the leaf sheaths of young plants, and when the spring comes they migrate to the early cereals and later to the summer crops. Their injuries to plants are caused chiefly by the fact that they feed upon the juices of the different parts of the flowers, and especially on the ovary, that is, in the cereals, the young grain. They migrate from one species of plant to another, for example, from rye to wheat and oats. He recommends the destruction of weeds, especially those belonging to the families Leguminosæ, Gramineæ and Compositæ, and the sowing of what one may term 'bait' crops such as rye or oats round the fields under cultivation. This should be done a fortnight before the time of sowing the winter cereals in order to attract the insects and afford them shelter when the crops are coming up. When the 'bait' crops are removed later, a large number of the thrips are removed also.

The various species of thrips appear to hibernate where they have been feeding: in the stems of grains which have died down, in crevices in the ground or under rubbish. In the case of species infesting cereals and grass crops they can be attacked only by the adoption of cultural methods. The hibernating stage is the most convenient stage of their life history to combat them. The burning of the grass or stubble in the fall and, either as an additional measure or as an alternative, the deep ploughing of the soil, will result in the destruction of a large portion of the hibernating individuals. Grain which has been infested should be cut as early as possible in the spring to remove the individuals recently emerged from hibernation before they have reproduced in any considerable numbers. After threshing, the screenings and chaff which contain large numbers of the insects, should be burnt.

THE WHITE-MARKED TUSSOCK MOTH (*Hemerocampa leucostigma* S. and A.)

This insect was extremely abundant in certain places in Ontario, New Brunswick, Nova Scotia and Prince Edward Island during the summer of 1910. In the cities of Halifax, N.S., and Charlottetown, P.E.I., and Kingston, Ont., its defoliation of the shade trees, well known in Toronto, caused the citizens some alarm. In Charlottetown, I found on examination that the larvæ had been fairly well parasited, and to some extent also in Halifax. Further observations on collected material indicate the same fact. It is not improbable that the outbreaks will be checked by natural means, but the uncertainty of the operation of such natural controlling agencies as the experience of the insect in Toronto exemplifies, necessitates the employment of thorough eradicative measures in cities where the value and importance of shade trees is unusually great.

Life history.—During the winter the conspicuous white or creamy-white egg masses having a frothy appearance may be found on the trunks and branches of trees, on fences and other places to which the caterpillars crawled when full grown. The young caterpillars hatch out at the end of May or early in June, and become full grown towards the middle or end of July. The mature caterpillar is distinct in form

* Korolikoff, D. M., 'Tripsi jivoustchie na nacikh Slakakh.' Isviestiia Moskowskago Selskhosiaistvennnago Instituta. (Annals of Agron. Inst. Moscow), Vol. 16, pp. 192-208. Moscow, 1910.

and colouration. It is hairy and measures from one and a quarter to one and a half inches in length. The upper side is dark with two longitudinal yellow stripes along the back. The head is coral red and there are a pair of tufts of black hairs projecting over the head in horn-like manner; a similar but single tuft of hairs projects from the hind end of the body. On the back of the caterpillar, beginning in the fifth segment, there are four white brush-like tufts of hairs and behind these there are two small, glandular projections of a brilliant red colour. The caterpillars usually leave the smaller branches when they have finished feeding and are full grown and wander down the trees to the larger limbs and trunks where they spin their cocoons in the crevices of the bark. Large numbers of the full-grown caterpillars wander some distance, finally spinning their cocoons on fences, the sides of houses and other places. In about a fortnight the moths emerge. The peculiarity of this insect is that the female moth is wingless and consequently is unable to fly. After emerging, the female rarely leaves the neighbourhood of the cocoon, but after mating deposits one to five hundred eggs in a white frothy mass on the outside of the cocoon. The male moth is grayish and measures about one and a quarter inches across the wings; the antennæ are large and feather-like, and a white spot in the outer hind angle of each of the fore wings gives the insect its popular name.

Natural enemies.—A number of species of birds feed on the hairy caterpillars of this insect, including the robin. Surprise has frequently been expressed to me that the English sparrow does not appear to feed on the caterpillar. The English sparrow not only does not feed on this insect, but it drives away those birds which do so, and is itself one of the greatest pests on this account, as it has driven away and thereby reduced in number many of our useful insectivorous birds. The most important natural enemies are parasitic insects.

Means of control.—The most effectual method of controlling this insect is by the destruction of the egg masses during the winter months. As the insect is in this stage for about six months or longer, ample time is afforded for the carrying out of a systematic campaign of egg destruction. The egg masses may be either collected and burned or destroyed on the trees by applying creosote by means of a small brush which may be attached to a long pole. On fences and other places they may be killed by means of a gasolene torch lamp such as painters use. When all the egg masses on a tree have been destroyed, a band of 'tanglefoot' about three inches wide should be painted round the trunk. This should be done before May and it will prevent any caterpillars which have hatched from eggs which have not been destroyed, from ascending the trunks of the trees; as all the egg masses on the tree will have been destroyed, no caterpillars will be able to gain access to the leaves on account of the band of 'tanglefoot.' A sticky substance similar in nature to 'tanglefoot' may be made by boiling together equal parts of castor oil and resin. The bands on the trees should be scraped from time to time with a wooden comb to keep the sticky surface fresh.

When the egg masses have not been destroyed, the trees should be sprayed before the end of June with an arsenical spray such as lead arsenate. This is used in the proportion of 3 or 4 lbs. of lead arsenate to 40 gallons of water. All cities having valuable shade trees attacked by this or other defoliating insects, should have a power sprayer. Nothing is more injurious to the tree or unsightly to the eye than the defoliation by caterpillars. Many of the cities of the United States regularly spray their shade trees, realizing their value as civic assets; in certain cases the losses which they have suffered in the past compel them to do this.

THE NARCISSUS FLY (*Merodon equestris* F.).

During the past few years this insect has been noticeably present in British Columbia. It was recorded in 1908 by Prof. R. C. Osborn*, having been caught by Mr. Harvey frequenting especially the flowers of the Salmon Berry (*Rubus spectabilis*). Professor Osborn believes that it properly belongs to our North American fauna, but I am unable to agree with him on account of its history in Canada and other countries. I am of the opinion that it has been introduced into Canada on imported bulbs, as I have found the larvæ during the present year on bulbs imported into Ontario from Holland. It had been previously captured on Mount Royal, Montreal, by Mr. G. Chagnon in 1903. In British Columbia, it is now a serious pest of bulbs, and Mr. A. E. Wallace reported it as attacking narcissus and daffodil bulbs near Victoria, B.C., about 50,000 bulbs having been destroyed in the year. Mr. G. Norman has kindly furnished me with particulars as to many of its habits in that locality which was visited in October. The perfect insect in seen from March to September and appears to begin to breed in May. The eggs are probably deposited in the centre of the leaf crown. The larvæ are found in the centre of the bulb, having made their entrance through the base of the bulb. The bulbs are destroyed by the larvæ or maggots eating away the flattened stem at the base of the bulb and afterwards destroying the centre of the bulb. Professor Ritzema Bos, State Entomologist of Holland, who has written the most complete account† of this insect, records the eggs as being laid in the soil adjoining the foliage. He informs me that it attacks chiefly *Narcissus tagetta* and *Jonquillas* in Holland. Mr. Norman has observed that the early varieties of daffodils, such as 'Golden Spur' and 'Henry Irving' are not attacked and that such varieties of narcissus as *N. poeticus ornatus* and *N. p. poetarum* suffer considerably.

The method of eradication which has been found most simple and efficient in Europe is the annual lifting of the bulbs and the destruction of all those which are found to be attacked by the maggots, as can readily be seen. This method has been found effective in England, and also, Professor Ritzema informs me, in Holland. Soaking in water is of no value and the destruction of the pupæ in the soil by the removal of the latter in the spring is impracticable in a large scale. Satisfactory results may possibly be obtained by poisoning the adult flies with sweetened arsenical baits, and experiments on this are being carried on in British Columbia.

NOTES ON THE MORE IMPORTANT INSECTS REPORTED TO THE DIVISION DURING THE YEAR.

The following notes refer to a number of the most prevalent insects which have been reported to and received by the Division during the past year (April, 1910, to March, 1911). Lack of space prevents a detailed treatment of these insects, but their occurrence is recorded for the sake of future reference, and for those who may desire such information as to the distribution and occurrence of certain of the more prevalent insect pests.

INSECTS AFFECTING FIELD AND ROOT CROPS.

Wireworms and White Grubs were reported most frequently. They were destructive to grass lands, cereals,, roots and other field crops. Root maggots were destructive to cabbages, cauliflowers, turnips, radishes and onions throughout Canada. The experiments which we are conducting on means of controlling these insects confirm our opinion as to the efficacy of the method of protecting the cauliflowers and cabbages by means of the tarred felt paper cards. This method is fully described in the report

* *Canadian Entomologist*, Vol 40, p. 10.

† 'La mouche du Narcisse (*Merodon equestris* F.)' *Arch. Musee Teyler*, Vol. 2, pp. 45-95.

for last year. For the protection of radishes and onions, the application of the hellebore decoction, using two ounces of hellebore to one gallon of water and watering the plants about once a week, has given the most success.

The Potato Beetle (*Leptinotarsa decemlineata* Say) was unusually abundant in Ontario, and was responsible for considerable loss to growers. Mr. Norman Criddle also reported them from Manitoba where the worst outbreak on record was experienced. This insect is gradually spreading through the west, and I found that it had already arrived in the region of Edmonton, Alta.

The Blister Beetles, namely, the Western Blister Beetle (*Cantharis nuttalli* Say), the Grey Blister Beetle (*Epicauta cinerea* Forst.), and the Black Blister Beetle (*E. pennsylvanica* De G), were abundant and destructive, especially to beans. The first was especially abundant in Manitoba and their prevalence in such numbers may be correlated possibly with the abundance of grasshoppers and locusts which were similarly reported as injurious to cereals in Manitoba. Mr. Criddle described an extensive migration of the locusts in July at Aweme, Man. The chief species were the Lesser Migratory Locust, *Melanoplus atlanis* Riley, and Packard's Locust, *M. packardii* Scudd.

The weevil *Silones hispidulus* Germ., whose larva destroys clover, was abundant at Orillia, Ont. *Nysius ericæ* Schill, was reported from Medicine Hat, Alta., where it was abundant and was attacking spinach, radishes, strawberries, lettuce, turnips and corn. The Flea Beetle *Haltica evicta* Lec. was very destructive to turnips and cabbages at Halfway Lake, Alta., and the Hop Flea Beetle was again serious in the hop yards of British Columbia. The Red Spider, however, was more injurious to the hops than the Flea Beetle. I was informed that it was compelling them to cease growing hops in some localities. Instead of a crop of six or seven hundred pounds to the acre, two hundred pounds to the acre were produced and these of very poor quality. The mite could be destroyed by winter treatment of the poles on which it hibernates; they could be dipped in a caustic solution or in coal oil.

The Pea Aphis (*Macrosiphum destructor* Johnson) was present in most parts of Ontario. It appeared to check the vigour of the growing vines.

INSECTS AFFECTING FRUIT AND FRUIT TREES.

The commoner pests were reported in the usual abundance, and as the life history and means of controlling certain of these, such as the Codling Moth (*Carpocapsa pomonella* L.), the Budworm (*Tmetocera ocellana* Schiff), the Apple Maggot (*Rhagoletis pomonella* Walsh), the Plum Curculio (*Conotrachelus nenuphar* Herbst), Oyster Shell Scale (*Lepidosaphes ulmi* L.) and Cankerworm were considered in the report for last year, it is not necessary to repeat them at length.

The Cherry and Pear slug (*Eriocampa cerasi* Peck), was injurious to cherry, apple and pear orchards in Quebec, Ontario and British Columbia.

Tent Caterpillars (*Malacosoma* spp.) were again extremely abundant in certain provinces, namely in New Brunswick and British Columbia. One of our officers, Mr. Tom Wilson, found the larvæ in millions at and west of Mission, B.C., and at other places in the valley of the Fraser River. Driving down to Upper Sumus, he found that the whole country had been devastated by the caterpillars, no leaves being left on the trees and the fruit hanging was half grown.

The Red-humped Apple-tree Caterpillar (*Schizura concinna* S. and A.) was very common in Ontario and was also recorded from Waneta, B.C., and Holmfield, Man. In Ontario it was found to be fairly heavily parasitised by the ichneumon, *Limneria guignardi*.

The Cherry Leaf Beetle (*Galerucella cavicollis* Lec), which feeds on the wild cherry, was reported from Halifax, N.S., as attacking cultivated cherries. Mr. L. Cæsar, of Guelph, found the Cherry Fruit Fly (*Rhagoletis cingulata* Loew) attacking

some cherries near Homer, Ont. It is not improbable that this insect is also attacking cherries in Quebec from which reports of similar injury were received. This imported insect was recorded by Dr. Fletcher in 1906*. He received it from Mr. W. R. Palmer, Victoria, B.C., where it was injuring some cherries. This was its first recorded appearance in Canada, and Mr. Palmer stated that he first noticed the holes in cherries in 1904. Infected cherries should be destroyed as soon as the injury to fruit is noticed. The Raspberry Cane Borer (*Oberea bimaculata* Oliv.) was reported generally from Ontario and Quebec, in some instances being particularly abundant. The Strawberry Flea Beetle (*Haltica ignita* Ill) was destructive to strawberry plants at Nelson, B.C.; over 180 specimens were collected from a single plant by jarring. This species also feeds upon other Rosaceæ. In Prince Edward Island the Strawberry Crown Borer (*Tyloderma fragariæ* Riley) was seriously injurious to the plants, and growers report that it is becoming more abundant annually. The only remedy is to dig up and burn infested plants before the fruiting season closes, that is, before the insect leaves the plant. Old beds should be thoroughly ploughed in the fall.

INSECTS AFFECTING FOREST AND SHADE TREES.

The Spruce Budworm (*Tortrix fumiferana* Clemens). The inquiries and reports received by the Division during last summer indicated that the depredations of the insect were more extensive than in the previous year to which reference was made in my last report. So serious did the situation appear, that many of the holders of timber limits were not unnaturally alarmed and feared the destruction of the spruce.

As the Department of Lands and Forests of the Government of the Province of Quebec, has a body of forest rangers throughout the province, arrangements were made by Mr. G. C. Piché, Chief Forestry Engineer of the Province, to obtain reports from them as to the distribution of the insect, and we drew up a questionnaire. The results of this inquiry and of the information which the Division of Entomology has received indicate that the insect is abundant in certain areas from Lake Timiskaming on the west to Lake St. John on the east and is sparingly distributed throughout the whole province down to the international boundary. The most serious devastations have been recorded from the region having River Desert and the upper Gatineau on the west to the Rouge River and Lake Ouareau on the east, from the region southeast of Lake St. John and from the River St. Maurice. In British Columbia, where I visited the infested areas last year and again this year, the most severely infested region is the southeast region of Vancouver Island from Salt Spring Island and Maple Bay south to the Saanich Peninsula. The accompaying map shows the recorded distribution of the Spruce Budworm in Canada at the present time.

In British Columbia some of the second growth Douglas Fir has been killed as a result of the repeated defoliation by the caterpillars. Visits were made to the Chicoutimi and Rouge River regions in Quebec in January. In both these regions it was found that the balsams had suffered more than the spruce. The tops of the trees were denuded not only of foliage but also of buds. The injuries had caused severe bleeding The tops of some of the trees which were felled were dead, but otherwise no injury could be found. Nor was there any evidence of an unusual secondary invasion by bark beetles. Cocoons of Braconid parasites indicated that these natural agencies were at work. From material which Mr. Arthur Gibson collected at Baskatong in 1909, a new parasite was reared. This has been described under the name of *Nasonia tortricis* by Mr .C. T. Brues, in '*The Canadian Entomologist*,' vol. 42, p. 259, 1910.

* In *Can. Ent.*, Vol. 41 p. 70, this species is described under the name *Rhagoletis intrudens* n. sp., by J. M. Aldrich.

Fig. 3. The distribution of the Spruce Budworm (*Tortrix fumiferana* clem.) and the Larch Sawfly (*Lygaeonematus erichsonii* Hartig.) in Canada in 1910. Spruce Budworm indicated by black circles, the Larch Sawfly by crosses.

Arrangements have been made for the study of the parasites of this insect and this will be carried out during the coming summer. Only by a knowledge of the character and extent of parasitism can the results of this outbreak be foretold with any degree of certainty. If the parasites are found to be increasing rapidly in number, as is frequently the case in outbreaks of insects native to the country, they will control the pest before it has accomplished the severe destruction which alarmist minds might be inclined to predict from the appearance of the forests last year.

THE LARCH SAWFLY. (*Lygæonematus erichsonii* Hartig).—The study of this insect was continued. A beginning of the study of the European parasites of this insect had been made by me before leaving England. This study was continued on account of its importance in relation to the serious nature of this insect's history in Canada. I am of the opinion that it was imported into North America and am supported in this belief by the history of the Sawfly since it was first recorded on this side of the Atlantic ocean, in 1881.

My investigations showed, and were confirmed by the continued study in England by Mr. Joseph Mangan, that the parasite, *Mesoleius aulicus* Grav., was not only the chief parasite as had been previously shown*, but had increased sufficiently rapidly to control the sawfly which was actually the case. It was found that over sixty per cent of the sawfly larvæ were parasitised. Accordingly arrangements were made for the collection of the cocoons in that region in England where the parasites had been found in so great abundance, and these parasitised cocoons are now on their way to Canada. An endeavour will be made to establish the chief parasite, *M. aulicus*, in different localities within the infested region which extends from Winnipeg, Man., to Cape Breton, N.S., as shown in the accompanying map. A beginning has also been made of the study of the native parasites attacking the sawfly larvæ. The chief of these appears to be a small Pteromalid *Coelopisthia nematicida* Packard, which deposits its eggs inside the cocoon on the hibernating larva and this is destroyed. The European and North American larvæ and adults of the sawfly were studied side by side and there is no doubt as to their being the same species.

The Birch Sawfly (*Hylotoma pectoralis* Leach) defoliated birches in the neighbourhood of Quebec and in Charlevoix county, Que., and was very destructive near Charlottetown, P.E.I. The larva is about three-quarters of an inch in length, yellowish in colour spotted with black and is usually abundant on birches in August and September. The Fir Sawfly (*Lophyrus abietis* Harr.) was abundant on spruce in Algonquin Park, Ont. Many pine trees near Magog, Que., were defoliated by Abbot's Pine Sawfly (*Lophyrus abbotii* Leach) the larva of which is yellow, spotted black and having a black head. The full grown larva measures about an inch in length.

The Spruce Gall Louse (*Chermes abietis* Chol.) was, as usual, abundant and injurious to White and Norway spruce in Ontario and Quebec. *Chermes similis* Gillette, was reported from Richmond, Que., and *C. floccus* Patch from Halifax, N.S., where it was rather seriously affecting spruce. Miss Patch finds that this species migrates to the needles of the white pine. *C. pinicorticis* was also abundant on the bark of white pine. The Green Striped Maple Worm (*Anisota rubicunda* Fabr.) defoliated maples near Newboro, Ont., and also along the shore of Georgian Bay. *A. virginiensis* defoliated oaks in the former locality. The White Cedar Twig Borer (*Argyresthia thuiella* Pack.) which causes the death and consequent brown appearance of the green tips of the cedar was abundant in Algonquin Park and other regions in Ontario.

INSECTS AFFECTING GARDEN AND GREENHOUSE.

A small Collembolan which Dr. Folsom kindly identified as *Xenylla humicola* (O. Fabr.) Tull., was received from Toronto and also from St. Thomas, Ont., where it occurred in enormous numbers forming patches several inches across. The Tarnished

* The Large Larch Sawfly, *Nematus erichsonii* Hartig. *Journ. Board of Agr.* vol. 15, pp. 649-660, 1908.

Plant Bug (*Lygus pratensis* L.) attacked and was destructive to dahlias and carnations in Victoria, B.C., also in Montague, P.E.I. Numerous inquiries were made concerning the Grape Vine Leaf Hopper (*Typhlocyba comes* Say), which attacks the grape vine and Virginian creeper, making the latter especially unsightly. It is a small insect about one-eighth of an inch long and is frequently wrongly called 'thrip' by gardeners. The injuries are caused by the insect puncturing the leaves and sucking the sap. The best eradicative measures are clearing away and burning fallen leaves and debris in the fall to destroy the hibernating adults and spraying the vines with kerosene emulsion soon after the leaves are fully developed.

APICULTURE.

It is gratifying to be able to report progress in this increasingly important subject. In three of the provinces, namely, Ontario (1906), Quebec (1908), and British Columbia (1911), legislation for the suppression of bee diseases now exists, and officers are being appointed to assist in carrying out the objects of such legislation. The Province of Ontario has a Provincial Apiarist, Mr. Morley Pettit, who is not only carrying on excellent educational work at the Ontario Agricultural College, but is endeavouring to place apiculture on the right basis. In Ontario it is estimated that there are at least 5,000 bee-keepers with an aggregate number of 100,000 hives. Estimates based on crop reports place the total amount of honey produced in the province at 5,000,000 lbs. This, however, does not represent a fourth part of the amount of honey produced in Ontario, which means that millions of pounds of honey are wasted annually.

Apiculture is not only important as a means of producing honey, but is an essential adjunct to fruit growing. No fruit grower should be without several hives of bees at least, as their important function as cross-pollinators is well known, and it has been repeatedly shown that their presence increases the amount of fruit produced. To the farmer who grows alsike and alfalfa they are similarly essential, increasing the amount of seed produced and also yielding honey of excellent quality; in some cases alsike is a failure owing to the absence of bees.

The most serious difficulty in the keeping of bees is the prevalence of two bee diseases. These are known as American and European foul brood respectively, and the legislation which exists has been enacted with a view to the prevention and control of these diseases, both of which are possible. Bee-keepers whose bees show signs of disease, such as the dying of the brood, the sinking and perforation of the cappings, etc., should immediately communicate with the Department of Apiculture of the Province in which they live or with this Division, to which samples of the diseased combs should be sent properly packed in tin or wooden boxes which may be mailed free.

The following advice is given for the benefit of those who contemplate keeping bees:—

Do not begin with too many colonies, one or two hives will be sufficient for the first year.

Obtain your bees from an apiary which is certified free from disease, otherwise it may result in the introduction of disease into new localities.

Have all your colonies in modern frame hives, and do not buy colonies in box hives unless they are to be transferred to frame hives. The Langstroth frame hive is recommended as being the standard hive.

The best time to purchase bees is during May, that is, before the honey flow begins.

It is advisable to consult a neighbouring bee-keeper of experience, if possible, before purchasing the bees and necessary appliances. The benefit of his experience will be of great value and may result in a reduction of the initial expense.

THE APIARY.

The following is a report on the apiary which is maintained by the Division for experimental purposes. Mr. J. I. Beaulne was placed in charge of the apiary during the summer of 1910.

The bees were taken out of the winter quarters and placed on the summer stands on March 31, 1910. They appeared to be in good condition until an inspection on June 8 revealed the presence of European Foul Brood. This disease was found to be very prevalent throughout the district and across the river in the province of Quebec. All of the thirty-eight colonies were given the 'shaking' treatment for this disease. By this means the bees were shaken off the old combs into clean hives containing new frames with starters, thereby removing all the infected material and compelling the bees to start the building of new combs. The bees are also forced to turn whatever infected honey they contain into wax. A second 'shake' on to full sheets of foundation was given in a few days and the bees immediately drew out the foundation. A number of weak colonies were united, giving twenty-one colonies, of which nineteen were in good condition for the honey flow.

In spite of this set-back, and the drying-up of the white clover caused by the drought between June 8 and July 15, the colonies did remarkably well. About 1,516 lbs. of honey was gathered, yielding over 70 lbs. of honey per hive. The greatest yield for a single colony was 144 lbs. and eight colonies gave an average of over 100 lbs. All the supers were removed on August 27. Between August 28 and September 9, twenty pure Italian queens were introduced in the hope of making the colonies more resistant to disease. Eighteen queens were accepted and began to lay immediately after leaving the introducing cages. By October 1 all the colonies contained large numbers of young Italian bees.

The colonies were brought into winter quarters on November 23 and 24, the average weight being 49½ lbs. At the time of writing (March 31) they are still in winter quarters and have come through the winter excellently so far. The temperature of the bee cellar from November 23 to March 31 varied from 41·80° F. to 45·20 F.; the temperature of the bee cellar should range about 40° to 45° F. not more nor less.

REPORT OF THE DOMINION BOTANIST

H. T. GÜSSOW

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Canada.

SIR,—I have the honour to submit herewith the second Annual Report of the Division of Botany. The report is divided into two parts (1), Diseases of plants, their identification and methods of treatment, and (2), Agricultural botany, under which division will be found accounts of work in connection with fodder and forage plants, weeds, and poisonous or otherwise injurious plants. The work of the Division has made active progress, the correspondence and inquiries dealt with having doubled since the last report. The increasing number of the letters plainly shows that an encouraging interest is being taken in the work by the farmers and fruit-growers of the Dominion.

I am able to report that, apart from the more common diseases attacking the grain and potato crops, no serious epidemic has appeared. There are, however, some specific diseases attacking the peach in the Niagara district, the rhubarb plant in the western provinces, and apples and plums all over Canada, which have come under my notice and which are being closely investigated. Satisfactory progress has also been made concerning the study of the more common smut diseases affecting grain, corn, millet, etc. It was found necessary to repeat a good deal of former work as there exists an unfortunate confusion as to the nature of attack and propagation of the different smut fungi, and also as to their correct method of treatment. This kind of work, requiring a whole season and longer for any reliable results to be obtained, seemingly makes slow progress, but it is hoped that the coming year will permit of collating valuable results, when they will be published.

I here take an opportunity to acknowledge and thank my assistant, Mr. Herbert Groh, B.S.A., and my secretary, Mr. Edward Lisle, for faithful and satisfactory services rendered. It is with regret that I have to announce the resignation of Mr. Groh, who has decided to go 'back to the land' where I trust he will be as successful in his work as he has been while connected with the Experimental Farm.

Since the first of January, in compliance with the wish expressed by the Hon. the Minister of Agriculture, I have taken over the control and management of the Botanic Gardens and Arboretum. A long-felt want was supplied in the provision of an experimental greenhouse for the carrying on of infection and other experiments during the winter months, which has already been found of the great value claimed for such facilities.

I have been absent during two months from the Division of Botany on an official visit to the west. This, being my first visit to the 'Great West,' has been found of great value in making field observations and in becoming familiar with the general conditions of the country.

In view of your approaching retirement from the position of Director of the Dominion Experimental Farms, I take this opportunity of expressing my appreciation of your courteous readiness to advise me in matters concerning the organization of this practically new Division, now under my charge, the establishment of which was largely due to your foresight in providing for this important branch of agricultural research.

I have the honour to be, sir,

Your obedient servant,

H. T. GÜSSOW,

Dominion Botanist.

PART I.

PLANT DISEASES IN 1910.

During the past year, a large number of diseases have been dealt with by this Division. Owing, however, to the fact that our work in this direction is as yet not sufficiently known, these cases, though over one hundred and fifty in number, are not cited as giving a comprehensive review of the plant diseases of Canada, but merely to serve as a record of the various outbreaks reported to, or observed by, us. The close proximity of some of the United States Experiment Stations encouraged a number of associations or private individuals to seek assistance in those quarters, and, partly for this reason and, partly, owing to the indifference of some growers towards the first outbreak of disease, our records are much less complete than they would otherwise be.

The following are some of the diseases that have been investigated during the year.

DISEASES OF CEREAL CROPS.

This is a constant enemy of the grain grower throughout the Dominion. No progress in our knowledge of the control of this disease can be recorded. The eradication of the barberry or other alternate hosts of the parasite is generally advised, though even in countries where the destruction of these plants is carried out under legislative measures, the results have not been altogether encouraging. It has been found, for instance, in Denmark, that the compulsory destruction of these carriers of the fungus, extending over the last decade, has brought no reduction in the severity of rusts. The selection of rust-resistant varieties appears to be the only practicable means of control, with our present knowledge. Such selection work should, however, be carried on in the particular locality where the seed is to be used, since it has been found that the same variety may diminish appreciably in its resistance when transferred to another region. Probably the best method available to the farmer is the selection for seed purposes of the plump, full-weight grain to be found in a crop which has suffered from rust during a season when the disease has been severe. Such grain is the produce of individual plants which have been rust-resistant to a marked degree, and the plants grown from these seeds will most probably inherit this property.

SMUT.

Stinking smut of wheat, in spite of the ease of its control, continues to seriously reduce the yield in some quarters. The smuts of oats, and covered smut of barley are likewise easy to control, yet a tax caused by these is voluntarily paid by the farmer in the form of a diminished yield, of a value which would excite a very vigorous protest if levied in the orthodox manner.

Loose smut of wheat and barley are advancing slowly in the western provinces. These latter kinds of smut are not affected by the seed treatments so successful with the forms just mentioned, and ignorance on the part of farmers of this difference in their nature has led some to question the value of seed treatment for any form of the

disease. This different response to treatment is due to the different modes of infection of the plants. The whole question of smut treatment and infection will be discussed in a separate bulletin to be issued after concluding our experiments on this subject. In the meantime we shall of course be pleased to assist any inquirer who may wish to know the methods of treatment.

Corn Smut and Smut of German Millet occurred in various localities.

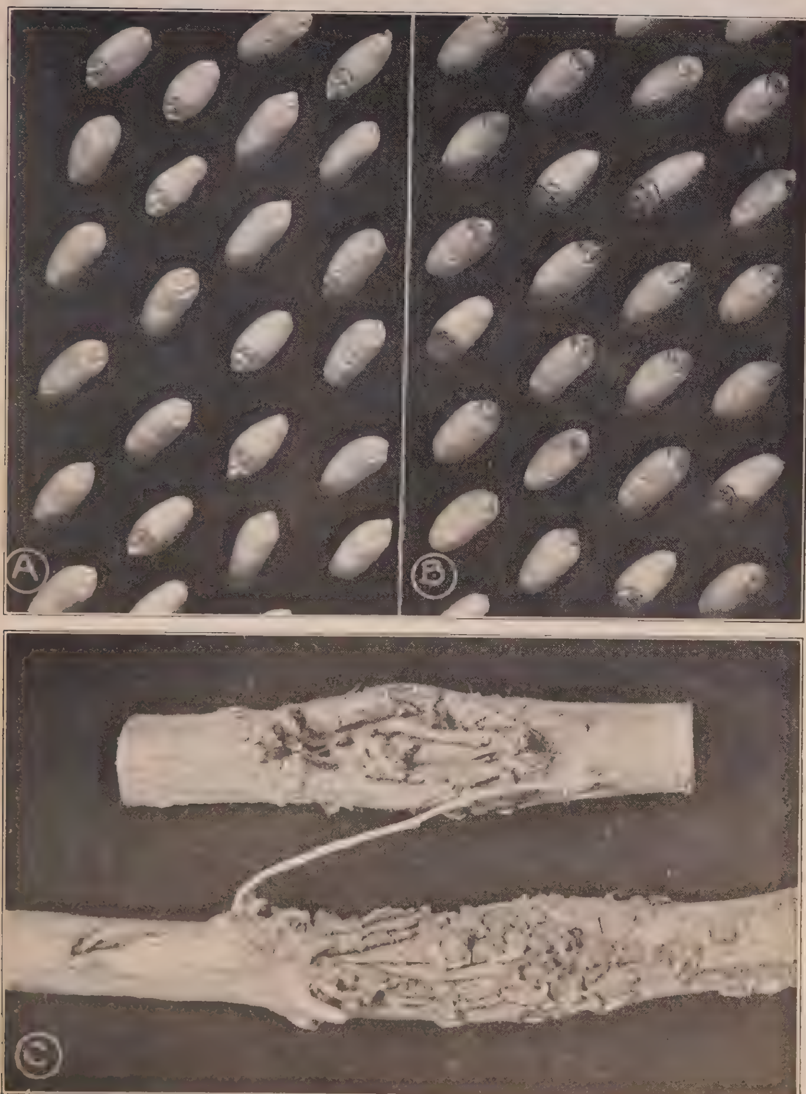
MILDEW OF WHEAT (*Erysiphe Graminis,* D.C.)

This fungus made its appearance in some experimental plots on the Farm and was twice reported from other localities. In spite of the leaves of the plant being densely covered with the greyish mildew, the plants suffered in no perceptible manner. The disease is said to be of some importance in low-lying, shady ground. An experimentalist would hardly choose such places for his plots and the adverse conditions referred to are not wide-spread on farms.

FROSTED WHEAT.

Complaints have been made by some farmers about unevenness in the ripening of the grain. This phenomenon may be due to physical causes such as drought acting locally upon undrained portions of the field, or to the mechanical or chemical condition of the soil, which may vary considerably in large fields. While sometimes no injury may result from frost, by cutting unevenly-ripened wheat, yet when frosty nights appear while the wheat is still in the field, though already cut, a large percentage of the grain is likely to be injured. It was noticed that when frosts came while the wheat was still uncut, no injury resulted, the power of the living plant seeming to be sufficient to prevent it. As a result of frost-injury, the grains become much shrivelled and darker in colour than sound ones; the weight per bushel is less and the germination may be considerably impaired. If such grain be subsequently used for seed it is only natural that, owing to unevenness in germination, which hence extends over a longer period, the produce of such grain will again ripen unevenly. It is evident, therefore, that frosted wheat should not be sown in the first instance, but attention should also be directed to the correction of defects of drainage, or of the chemical or mechanical conditions of the soil.

In this connection, mention may be made of a curious discolouration present in wheat grains received from localities far apart (Ontario and Saskatchewan). These samples contained a large proportion of grains (according to our experience, 8 per cent), apparently quite normally developed and plump, but the embryo exhibited signs of a brownish discolouration, which in some cases extended all over that portion of the body of the grain itself. The grains did not appear unlike barley grains injured by the fungus, *Helminthosporium,* where, however, it is the opposite end that is browned. Our correspondents assured us that this discolouration had been noticed during the last few years quite regularly, in some cases affecting the harvest up to about 20 per cent. The germination of the grain did not seem influenced, but the young plants raised grew less well than those from sound seed. We wish now to continue our experiments in the field. A photograph of this wheat is here reproduced. (Plate 4 *a*, *b*,) showing the discolouration plainly, and any farmer who has had similar trouble will greatly oblige us by relating his experience, giving us all particulars, and by sending us a sample of the affected wheat.



A. and B. Dawson's Golden Chaff Wheat. (*a*) Sound grain with light-coloured embryo. (*b*) Grains showing dark-coloured embryo.
C. New peach disease. Two severe cankers on five year old wood.
16—p. 240.

BACTERIA INTERFERING WITH MALTING PROCESS.

The following remarks are extracts from correspondents' letters, and notes on the result of our investigation into the cause of the trouble referred to therein. For reasons it is desirable not to disclose in this report, the identity of the parties concerned, but reference is made to the subject because of its general importance in the growing of malting barley in Canada.

HISTORY OF THE BARLEY.

'Much interest has been taken during the last three or four years in producing a class of barley suitable for malting purposes, similar to the world-renowned Galatina barley produced under irrigation in the state of Montana. This is contracted for a year at a time and is produced entirely for European export. One or two importations of this barley have been made from Montana, and last year a quantity large enough for an experimental export shipment was produced. The barley in question was sent to Messrs........., a very competent firm, probably the largest maltsters in the British empire.'

NATURE OF COMPLAINT.

One correspondent stated: 'It is with the greatest regret that I have to inform you that we met with a very serious misfortune as regards the barley you sent us. We divided a parcel into two lots, one to check the other, and we have had a most extraordinary development, something I have never seen before in all my malting experience, and which some experts have put down as a species of yeast, followed by the development of bacteria, destroying the value of the grain; and it is almost dangerous to use in brewing operations. It appears at the outside of the grain at one end during the process of malting, with a peculiar pink colour, which gradually develops and stains the rootlets, and also permeates the starchy matter below the skin. So peculiar is it, that I have sent a sample of it to a number of scientific friends, knowing it will be specially interesting, and have asked for their opinion. We have taken the greatest care not to reveal where the barley came from, as I have no desire to give even the locality a bad reputation. I am rather at a loss to know what to do with it, as I am told the only method of destroying the bacteria is to subject it to excessively high temperature, which reduces its value very considerably as a malt. Can you tell me anything of how the land was treated, where this barley was produced? I presume no manure of any kind was used upon it. What was the nature of the soil upon which it was grown? So far as I can learn, they attribute it to a matter of infection, the source of which has to be discovered. It is most regrettable, as I had prepared the way for one or two of our leading brewers to make practical tests of it, and I am afraid now to submit it to them for the reasons already stated.'

From this account it would appear that the barley referred to here is not only altogether unsuitable, but even dangerous, from the risk of infesting a brewing establishment with an organism of some kind that renders the process of malting a practical impossibility. It will also be realized that if the barley is really responsible for this trouble, and not any treatment that it may have been subjected to, it would seriously compromise any industry interested in the production of a first-class barley. Further correspondence states:—

'The barley was grown on absolutely virgin prairie; it was put in on first breaking and was the first crop. The seed was most carefully handled and cleaned and was the second generation from the original importation. The first crop producing the seed from which the second crop was raised, was also put in on virgin land. The seed was treated with formalin before sowing and the solution was that laid down by the

Dominion Experimental Farm. The sacks in which the barley was shipped were new.'

The grower thus gives valuable evidence of careful treatment of this barley and, as the matter seemed of considerable importance, a careful investigation was started with the view of throwing some light on this mysterious trouble. The brewer was communicated with; a sample of the barley was obtained from him and further particulars requested and supplied as follows:—

Q. I take it the sample of barley as submitted was not subjected to any treatment whatever, but faithfully represents the bulk as actually supplied?—A. The barley has been passed over our screening plant to extract the broken corns, dust or any other extraneous matter detrimental to the process of malting. The sample submitted fairly represents the bulk, and the bulk was in our possession throughout.

Q. Kindly submit a sample of any other two-row barley that has received the same treatment as the sample sent?—A. We are sending you samples of our Scotch two-row barley which has received the same treatment.

Q. What was the germination of the barley before using?—A. Germination showed well; 98 per cent growing.

Q. The peculiar growth developed after 'steeping.' How long are the grains steeped? State the temperature?—A. The steeping referred to was in the ordinary process of malting, and the barley is kept under water for thirty-eight hours in all, although it occupies the steep for seventy-four hours. The following is the process, viz.:—

First: 14 hours under water.
12 hours water drained off (for aeration).

Second: 12 hours under water.
12 hours drained.

Third: 12 hours under water.
12 hours drained before casting on to the malting floor; the temperature of the water being 45°. The water is very pure and soft.

Q. On the malting floor, what is the height of the layer and temperature of the floor?—A. The depth of the layer on the malting floor is 9 inches and the temperature rises slowly and gradually from say 55° at time of casting to 65° before being loaded to the kiln about the 11th or 12th day.

Q. Are you aware that it is a constant occurrence in the growing floor that bacteria, yeast, etc., will appear if the sample of barley is not of a high germination. That is, in old barley?—A. Yes, we are aware of the existence of all these in all classes of barley, both old and new.

Q. I note you have made pure cultures of the peculiar pinkish growth. Would you please send me a tube and state the composition of the medium on which it was grown?—A. The growth was cultivated in a wort gelatine. We are sending you a tube with the culture.

Further observations were contained in additional letters which may be summarized as follows:—

'About the fifth day on the growing floor, there was noticed a very peculiar pinkish colouration, which started at the embryo and which eventually permeated the whole grain, discolouring the husk and also the rootlet, the rootlet being, at the same time quite fresh . . . . finally we discovered that the endosperm was completely converted into a slimy matter and the rootlet turned brown.'

REPORT.

The sample of barley was examined microscopically and tested for odour, germination and any outward unfavourable signs.

About 4 per cent of the barley grains showed brownish discolouration towards the tapering end, and a few spots of the same colour were also found on the body of some grains. Microscopical examination of the discoloured tissues showed the absence of fungi as *Helminthosporium*, etc., and therefore, considering the high germination of the sample, this sign was considered to be of no consequence.

The odour of the barley was neither musty nor mouldy, although not quite fresh or strong. It must be borne in mind, that this sample had twice crossed the Atlantic and naturally the odour would have been affected.

The germination was tested independently with the following results:—

Ottawa Seed Laboratory, Department of Agriculture, 96 per cent germination.
Chemical Laboratory, Central Experimental Farm, 96 per cent germination.
Botanical Laboratory, Central Experimental Farm, 97 per cent germination.

As far as germination and external appearance are concerned, this barley was an exceptionally good sample for malting purposes.

The barley was next subjected to the steeping process and was malted:—

(*a*) Under conditions providing no ventilation, a moist atmosphere and at a higher temperature, (30° C.).
(*b*) Under conditions providing good ventilation at ordinary room temperature.

About four days after being kept in the moist chamber (*a*), the barley which showed the first signs of germination after forty-eight hours, developed a peculiar pinkish colouration, appearing like fine, dew-like drops on the rootlets and the body of the grain. At that time, no such changes could be observed in the other culture (*b*). This colouration was immediately recognized as resembling a common occurrence familiar to all investigators of the germination of cereals, (barley, rye; wheat especially). In laboratories, the development of little yellowish or pinkish slime growths may often be noticed and they have been repeatedly recorded. They consist of masses of bacteria,(*Zoogloeae*). The discolouration increased visibly and soon was noticed extending all over the layer of roots that had formed on the bottom of the glass vessel used, on the sixth day. Even then no colouration of this kind could be observed in culture (*b*).

About ten days after starting this experiment, all roots were covered with this distinctly manganese-pinkish slime. It was then observed that the roots were fading and becoming brown in colour. This fact is not attributable to the action of the bacteria, but solely to the exhaustion of the food reserves by the young plant. From time to time microscopical examinations were made of the slimy roots, showing that the bacteria not only covered the surface but inhabited also the loose cells of the root cap in the form of narrow streaks. The endosperm was never observed to be permeated, but was covered to some extent externally. The sliminess observed by our correspondent is, in our opinion, due to the natural dissolution of the food material used up by the growing plant. An organism was isolated in the usual manner and pure cultures were made on a decoction of barley roots, agar, and maltose on which, after thirty-six hours, a profuse growth appeared which turned pinkish in colour after sixty hours.

On potato, the organism grew with an irregular border, moist, glossy in appearance and distinctly manganese-pink. The potato substratum all round the growing colonies was pink in colour.

On gelatine, the colonies grew readily and produced a bluish-red tint. Gelatine not liquefied. Stabs grew right to the bottom.

The bacterium appeared as rods, 1·3 to 2μ long, $0·6\mu$ broad. Flagella, many, (peritrichial); Gram negative.

The organism was provisionally identified as Düggeli's *Bacterium herbicola rubrum** which was carefully studied in 1910 by Dr. Zikes of Vienna†.

On receiving subsequently a pure culture of an organism from our correspondent which was obtained from the pinkish slime originally observed where the grain was malted, subcultures were made on the different media already referred to, with the identical diagnostic results. The measurement of this organism also agreed with ours.

On submitting one of the subcultures to Prof. Delbrück, of Berlin, Germany, Dr. P. Lindner, in charge of this work, very courteously expressed his opinion that the organism was probably identical with Düggeli's *Bacterium herbicola rubrum.*

This organism, together with a number of yellow Zoogloeæ (*B. fluorescens liquefaciens, B. herbicola aurea,* etc.) though less common, may frequently be observed on germinating cereal seeds. There is no doubt that the presence of the bacterium on this barley is not due to any diseased condition. It is practically always possible to isolate this and related organisms from most of our cereal seeds, where they occur on the surface. In order to ascertain whether we should be successful in demonstrating this fact, some two-rowed barley grown on the Experimental Farm and the sample of Scotch barley referred to by our correspondent were subjected to the same treatment, with the result that the organisms made their appearance under close atmospheric conditions. It is evident that the organism is a surface-covering bacterium, which will, if afforded suitable conditions for development, become more or less conspicuous. It being a common practice to wash the grain with lime water before casting it upon the malting floor, to prevent any fungus or other spores from appearing during the process of malting, it was thought advisable to make this experiment on our correspondent's barley. On carrying out this experiment with it, no trouble from any organism was experienced.

We therefore suggest washing the grain with lime water before malting which would in no way interfere with the malting process, and would also prevent the recurrence of the above unpleasant experience.

The above report was submitted to our correspondents and, after settling some few points, one of which was that 'no lime water was used in the case of malting the barley under question, as it was wished to put it through the malting process in its most natural state, as a guide to us in making a first test of a new class of barley,' both correspondents expressed entire satisfaction on the results of this investigation.

In conclusion, I may say that great credit is due to both our correspondents for their discreet way in handling an affair of this kind, which might indeed have been seriously compromising to the future growing of this special barley if they had not placed their experiences, samples and cultures at our disposal.

APPLE DISEASES.

FRUIT PIT OR BITTER PIT OF APPLES.

(Plate I 'a').

Among the more obscure troubles that may cause annoyance to the apple grower, the so-called 'bitter pit' or 'fruit pit' is worthy of mention. While becoming most noticeable during cellar storage, it may also often be detected on the tree before the fruit is full grown. The early stages are visible as sunken spots on the surface of the apple up to a quarter of an inch or more in diameter. At these places, the skin is

* Düggeli; Zentralblatt für Bacteriologie, Part 2, Vol. XII., pp. 602, 695. Vol. XIII. p. 56, p. 798.

† Zikes, Dr. Heinrich, Sitzungsbericht, Kais. Akad. d. Wissensch. in Wien; Math.—Nat Klasse, Vol. CXLX, Part I., January, 1910.

not only unbroken but there is little or no alteration in colour. If cut into, however, a pocket of dead and discoloured cells will be found lying immediately below. Ultimately, this discolouration extends also to the surface layer of cells and the spots become brown, the skin still remaining unbroken. They also often increase in size and a number of them may coalesce to form one large affected area.

It is found also that the superficial changes mentioned above are generally associated with deeper-seated ones in the flesh of the apple. On cutting such an apple, brown spots may be seen scattered through it, chiefly in the more external region but sometimes extending almost to the core. Although seen in this way as isolated spots, if carefully dissected out they will be found to be of the nature of strands rather than of spots and follow the course of the vascular bundles or sap-tubes which they surround. Either the superficial or the internal appearances mentioned may, however, occur alone. In many cases, but not always, the dead masses of tissue have a bitter taste which has led to the application of the term 'bitter pit.'

Cause.

No one has succeeded in finding any organism associated with this disease, and from the work that has been done on it with negative results, it appears in the highest degree probable that it is not of a parasitic nature. Hence no kind of spraying can be of any value. It appears to be caused by some inadequacy of the water or sap supply at some stage in the development of the fruit, by which means certain of the cells are deprived of their requirements in food and water. Whether the cells are actually starved from want of food or whether the lack of water results in too great concentration of the substances in the cell sap is not clear, but the ultimate effect is the death of the cells, which now form the discoloured areas described. As in so many cases with these so-called physiological troubles it is difficult to make any recommendations. The causal factors are on the one hand, rapid loss of water from the fruit and on the other an inability to make good this loss with sufficient rapidity. Hence dry seasons or periods of drought may be expected to increase the trouble, while much difference is to be found in different varieties in their degree of susceptibility, on account of their varying powers of sap conduction, etc. There is no doubt that this is one form of the so-called 'Baldwin Spot.' On the other hand recent investigations point to a fungus (*Cylindrosporium Pomi*, Brooks), as being often the cause of this disease, and in such cases a spraying given late in June or even early in July has been found of value. The existence of two forms of disease, much alike in appearance, but of totally different nature, one due to a fungus and the other to a disturbance in the normal physiological conditions in the plant, will explain the contradictory results of spraying experiments for the so-called 'Baldwin Spot.'

A WESTERN APPLE DISEASE—APPLE TREE ANTHRACNOSE (*Gloeosporium Malicorticis*, Cordley).

Specimens of this disease have been received from British Columbia, and a personal examination was also made of trees attacked on Vancouver Island. The disease is known in the apple orchards of the Pacific Northwest of the United States, and has also been recorded from Oregon and Washington. Casual untrained observers have often confused frost injuries of the bark with this parasitic disease and, for this reason, a careful description is necessary to prevent any errors of diagnosis, which may naturally be followed by the loss of trees. Frost injuries may cause depressions and discolourations of portions of the bark, and may give rise to cracks and cankers, and thus closely resemble the Anthracnose, but the latter is readily distinguished by numerous small ruptures in the sunken-in patches formed by the fruiting layers of the

fungus causing this disease. These ruptures are rarely absent and at the proper time they contain ripe spores of the fungus which, at later periods, may no longer be found therein. So any careful observer can, by means of a pocket lens, easily determine whether an injury is due to frost or to the fungus. This confusion, no doubt, accounts for some of the unsuccessful attempts in combating the disease by sprays.

Apple-tree Anthracnose manifests itself on branches of apple trees by clearly defined, depressed, dark-brown areas of more or less large dimensions. If the disease is allowed to make unchecked progress, it will completely girdle the attacked branch, which will consequently die. There may be a large number of separate infections on a single tree. During the winter months, the progress of the fungus is almost at a standstill, but early in the spring it becomes active again, which may be noticed by the increase in circumference of the dead areas. In May or June small ruptures appear in the bark where the fungus produces a large number of single-celled colourless spores of the genus *Glœosporium*.. These spores germinate and reproduce the disease when they encounter favourable conditions for their development.

From the life-history of the fungus, we would suggest the following means of control: Remove all branches that are girdled or very nearly girdled by the disease and burn them. All trees should be sprayed with lime sulphur in autumn, not later than when all leaves are off the trees. Early in spring, this spray should be repeated to be followed shortly before the unfolding of leaves or flowers by Bordeaux mixture.

BLACK ROT (*Sphæropsis Malorum,* Peck).

Although this disease has been found on pears and quinces, our records of its occurrence in this country are confined to the apple. It may appear on the leaves, fruit, or woody parts of the tree, producing more or less characteristic effects.

On the fruit.—This is perhaps the best-known form and its appearance has led to the name 'Black Rot' being applied to it, a name now used for the disease in general. The apples are infected through some injury (wasps, curculio, hail, etc., etc.) The diseased flesh becomes discoloured, but remains firm and, later, its entire surface becomes covered with minute black pustules. Each of these black bodies is a fruiting body or *pycnidium,* inside which spores are produced. This phase of the disease is comparatively unimportant, rarely causing an appreciable loss.

On the leaves.—Here a characteristic spotting is produced. The spots vary from ⅛ to ¼ inch in diameter, and are of a brownish hue surrounded by a well-marked purplish border. The *pycnidia* do not, as a rule, develop till the leaves have fallen to the ground.

On the limbs and trunk.—It is here that the most serious effects are produced, the growth of the fungus giving rise to 'cankers' of the large limbs of old trees and of the trunk as well in the case of young trees. These differ from the cankers due to 'fire blight' in being raised rather than sunken, and in having the surface cracked and roughened instead of smooth. Later, the surface becomes covered with the little, black fruiting bodies previously referred to as occurring on the fruit. These cankers are perennial and often have a zoned appearance as a result of the growth in successive seasons. They may extend for considerable distances up and down the limb and finally work right round it, girdling it and causing its death. The damage done by this 'black rot canker' has recently created considerable alarm in certain districts in Ontario, particularly in Prince Edward county. ,

Control.

Prevention of the disease largely resolves itself into general care of the apple orchard and the selection of varieties hardy enough to be proof against winter injury in the locality under consideration.

In an orchard where good cultivation and the general clearing up of refuse are practised and the proper sprayings for apple scab given, the disease is not likely to be troublesome. Hardiness of the variety is important, since, apparently, the fungus can only gain entrance to the woody parts as a result of some injury such as that done by frost, sun scald, etc.

Where the cankers are already in evidence, they should be cut out with a draw-knife or other instrument. In doing this, care must be taken to cut well beyond the limits of apparent disease as shown by discolouration. The cut surface should then be treated with some good disinfectant like bichloride of mercury (Corrosive sublimate), one part in one thousand of water and painted over with coal-tar or with paint free from turpentine. In spraying, attention should be given to the covering of the limbs and trunks with the spray mixture. Rotting apples should be gathered up and destroyed.

N.B.—While corrosive sublimate is in many respects the most powerful and satisfactory disinfectant in such cases, too great caution cannot be exercised in its use on account of its intensely poisonous nature. Furthermore, it is strongly corrosive to iron and the solution should always be made up and kept in wood or glass vessels. A convenient form is the tablet, obtainable at most chemists, containing such an amount that one tablet to a pint of water gives a solution of one to one thousand strength.

BITTER ROT OF APPLES (*Glomerella Rufomaculans,* [Berk.] Spauld. & Von Sch.)

This is one of the most serious enemies of the apple crop in many of the apple-growing regions of the United States. In this country, it may be looked for in the warmer districts, but it is probable that many reported cases, particularly of canker injury, have been really due to the Black Rot.

The disease causes two well-marked and distinct effects, a canker on the twigs and young branches and a rotting of the fruit. In contrast to Black Rot, however, it is the disease on the fruit which is most destructive. A small, brown spot is first noticed, which rapidly extends under favourable conditions, the tissues becoming soft and wet. Later, the surface sinks, becomes shrivelled and wrinkled, and the dead tissues finally become dry and corky in texture. As the disease progresses, numbers of spore-pustules appear on the surface of the affected area, beginning to show near the centre and following the spread of the disease. These are filled with pink spores.

While the disease may attack the fruit at almost any stage if the climatic conditions are favourable, it is chiefly noticed as the fruit approaches maturity, and hence the term Ripe Rot is also given to it. Hot, wet weather is particularly suitable for the rapid spread of the fungus. Fruit in an advanced stage of the rot generally falls to the ground, while the less badly attacked apples may be found still on the tree.

Control.

It is important to prune out and destroy all cankered branches, since on these cankers are produced the crop of spore pustules of the parasite. Spores from these infect other twigs and give rise to a second crop which serves as a starting point of the fruit infection. Destruction of attacked fruit is also important. In addition, spraying with Bordeaux mixture or other fungicide is necessary. The first spraying should be given about forty days after the petals have fallen and be followed by three more at intervals of about two weeks. The number of sprayings, however, and the intervals between them will depend upon the prevailing weather conditions.

APPLE RUST AND CEDAR 'APPLES,' (*Gymnosporangium Macropus*, Link).

Many observers are familiar with the woody galls so frequently found on the Red Cedar (*Juniperus virginiana*) but probably few are aware that these 'cedar apples,' as they are called, are connected with the 'rust' of apple trees. Yet such is the case, and although 'apple-rust' is, in this country, rarely reported as a serious disease, it may be of interest to briefly outline the life-cycle of the fungus which gives rise to two such widely different effects.

In the spring time, after rains there will be noticed protruding from the cedar-apples a number of orange-coloured, gelatinous, and usually horn-like outgrowths, produced by the swelling of the masses of resting spores inside the gall. On the surface of these protuberances, vast numbers of minute spores are formed and, as the gelatinous mass dries, these spores are scattered by the wind. If blown on to certain parts of an apple or crab tree, such as the leaf or young fruit, or occasionally the young twigs, they produce infection of this new host, and the green colour of the healthy tissue becomes changed over the infected area to a yellow or orange tint. Later on, there will be found arising from this spot small, tubular outgrowths of a yellowish or cinnamon colour, inside which are produced spores of another kind. This is the apple 'rust' and corresponds to the 'cluster-cup' stage of the common grain rust found on the Barberry leaf with the rim of the cup prolonged into a tube. The spores now borne can only produce a further development if carried to the Red Cedar where they give rise again to the cedar-apples, a process which occupies two seasons.

Control.

The only satisfactory means of preventing the disease on one of the alternate hosts is to avoid growing the other in the immediate neighbourhood. Since the apple tree is the important one, except in very exceptional cases, neighbouring red cedars should be cut down and destroyed. A certain amount of infection may still take place by spores carried from a distance but this will be found of negligible amount. In cases where it is desired to keep the red cedars for ornamental purposes, something may be done by cutting off and *burning* all cedar apples before the horn-like outgrowths have appeared in spring. Spraying has not yielded good results.

SOOTY MOULD (*Capnodium*, Sp.) ON APPLE TWIGS.

During the year, an interesting communication was received asking if a 'Black Knot' disease, similar to that on plum and cherry trees, is found on the apple. The inquiry was accompanied by a number of twigs encrusted with a black, irregular warty growth, somewhat resembling the excrescence of the familiar 'black knot.' Examination, however, showed this growth to be quite superficial in its nature; the fungus—a species of *Capnodium*—having developed and produced its fruit bodies around the twigs, but not having entered the tissues of the host. Such fungus growths are not uncommon on various plants and are usually observed in association with aphis attacks, the 'honey-dew' excreted by these insects on the leaves and branches forming a medium very favourable to the development of the fungus. Such growths are of no particular importance, as a rule, apart from their somewhat unsightly appearance, but at times may cover the surface of the leaves to such an extent as to interfere with their functions. Where insect pests are systematically combated, the conditions necessary for such a result are not likely to be found.

A. "Bitter Pit" of apples. B. "Frost Belting" of Pears. The pear to the right showed the frost belt clearly between the white lines.

DISEASES OF PEARS.

'FROST BELTING' OR 'FROST BANDS' OF PEARS.

(Plate I. b).

The accompanying illustration represents the peculiar appearance of some Boussock pears which were taken off a tree growing in an orchard in British Columbia. The pears, which were quite perfect specimens as regards size and taste, showed a peculiar 'band' or 'belt' of brownish tissue just above the lower, broader portion of the fruit, resembling the well-known 'russeted' condition with which we are familiar in the well-known 'Russet' varieties of apples and pears (*Golden Russet, Sheldon, Bosc*). Medlars (*Mespilus*) as a general rule also show the 'russeted' appearance spoken of. These pear fruits however, showed only russet 'rings' about three-quarters of an inch broad, while the remaining portions were normally green. Probably eighty per cent and more of the fruits of this variety showed this appearance. It has been ascertained that apples like the common Golden Russet may be grown without exhibiting the roughish brown surface, and in consequence this condition may be considered as abnormal. Microscopical examination of all kinds of russeted fruits has shown that their appearance is due to the formation of corky cells, which certainly cannot be considered as normal on the surface of these fruits. The formation of cork cells is invariably an indication of an irritation of some kind. They may be produced artificially on any kind of fruit by very slight abrasions of the epidermal cells. Hence corky-cell patches of more or less large dimensions frequently occur when fruits 'rub' against each other or against a branch. Chemicals also produce similar effects. The most common spray injuries from Bordeaux mixture become largely apparent by the formation of cork cells, likewise any substance that is likely to act destructively upon the waxy covering of fruits, may produce similar effects. Lastly, frost has been held responsible for the changes of the epidermal cells into cork cells. In many fruits, the russeted appearance is now regarded as typical and while, strictly speaking, their appearance is due to their tender epidermal cells being injured by frost, nobody feels concerned about it. On the other hand, when any cause renders an otherwise perfect fruit 'patchy' it is natural that the grower should seek the cause, as a drop in the market price is likely to result.

The curious 'belt' on the pears in this case is due, no doubt, to the influence of low temperatures, which prevailed during certain days, as we were able to ascertain from the thermometer readings for that locality kindly supplied to us by the Meteorological Station of the Observatory in Toronto. The curious feature of this case is the fruits showing this characteristic 'belt' only, of a very uniform size and at the same place. Frequently one may observe, in these flask-shaped pears, the lower broader half totally russeted while the narrow tapering portion remains green. In some apples and pears we have observed the same phenomenon forming a ring just around the calyx of the flower. Careful study of the reason for this difference in the formation of the belts showed that some fruits of different varieties of apples and pears are covered, in their very young stages, towards the calyx with dense masses of fine hairs. Sometimes these surround the calyx only and any moisture that may naturally be present through atmospheric conditions freezes and the underlying tissues become injured. In some varieties of pears, the hairs cover the calyx end for the greater portion of the fruit and a frost belt is produced just above them, the hairs naturally providing a protection. If any one interested will carefully examine the different fruits, this observation may easily be proved, especially in the case of the Boussock pears. Varieties of fruits commonly russeted very rarely show any hair covering. The injury thus shows itself of little consequence and growers need feel no alarm.

LEAF BLIGHT OF PEAR AND QUINCE (*Entomosporium Maculatum*, Lev.)

On the leaves, this disease shows most clearly on the upper surface. It appears as spots, more or less circular in shape, becoming reddish in the centre and with a dark margin. The effect on the leaf will depend on the number of such spots, bad attacks resulting in the yellowing or browning of the leaf and its premature fall. A disease with which it may possibly be confused is the Leaf Spot, (*Septoria Pyricola*, Desm). In this latter case, however, the spots are large and more angular and there is not the same difference in appearance between the two surfaces.

On the fruit a similar spotting is produced, red at first and subsequently darker, often followed by cracking.

The disease may be controlled by the same spraying treatment as employed for pear scab.

DISEASES OF PLUM AND CHERRY.

BLACK KNOT OF PLUM AND CHERRY (*Plowrightia Morbosa*, [Schw.] Sacc).

(Plate III. b).

The striking and unsightly appearance known as 'black knot' is familiar enough to the grower of plums and cherries, and a few remarks as to its origin, nature and manner of growth may not be out of place. It may be found on nearly all varieties of plums and cherries, both wild and cultivated, and it is generally assumed that the forms occurring on these different hosts are due to the action of the same fungus. It is this fact of the disease being, presumably, transmissable from wild to cultivated trees that makes it difficult to control unless the neighbouring wild trees are eradicated. The popular name for this disease is well chosen, since, in its mature condition, it consists of a rough, black excrescence on the branches extending often for several inches up and down, but usually not going right around. It affects only the woody parts of the tree. This black mass when fully formed is full of small chambers each containing a number of spore-bearing tubes (*asci*). These spore cases develop during the winter and the contained spores are scattered during the early part of the year. The new infections appear as swellings which crack the bark and later become covered with a velvety, olive-coloured, spore-bearing layer. The formation of these 'summer' spores continues to about midsummer, when the change to the black, hard knot begins to take place.

Control.

All knots should be cut out several inches below the apparent limit of the knot, so as to be sure to remove all the mycelium of the fungus which might otherwise start into growth again. This is best done when the leaves are off the trees, but the operation should be completed early in the year, before, say, the first of March. After this a watch should be kept for knots developing during the growing season and they should be removed as soon as noticed. As mentioned above, where the disease is bad, attention should be given, if practicable, to the wild trees in the immediate vicinity. Spraying specially for this pest is hardly profitable, but the usual applications against other diseases will help also as preventives against this.

PLUM POCKETS OR BLADDER PLUMS (*Exoascus Pruni,* Fuckel).

(Plate II. a).

This disease occurs on the different wild and cultivated plums. The most characteristic effect is the malformation of the developing fruit described by the common names given above. The infected ovary is enlarged and distorted, the texture is spongy and the stone absent. The colour is at first yellowish but later becomes greyish owing to the production of spores on the surface. Finally the bladders turn black and fall.

The parasite causing this disease very closely resembles that of the Peach Leaf Curl and the treatment there given is applicable here also. It is believed, however, that the mycelium of the fungus may live from year to year in the affected twigs, growing out into the fruit buds and infecting the ovaries. Hence, pruning out and burning of attacked shoots is often recommended. In any case the pockets should be collected, before the spores form, and burned. It is also necessary to treat affected wild trees in the immediate neighbourhood in the same way, or else destroy them altogether.

A NEW DISEASE OF PEACHES.

(Plate IV. c).

Reference should be made to an outbreak of what appears to be a specific peach disease, to which attention was directed towards the close of the year. This disease occurs in the Niagara district and extends into New York state wherever peaches are grown. It manifests itself by larger or smaller cankers occurring on trees of all ages, often somewhat like the common black knot of plums and cherries. Closer examination shows, however, that these 'knots' are characteristic canker spots. They may occur on all parts of the tree, the main trunk, especially the crotch, smaller limbs and quite young wood. In some instances, the cankers encircle the whole limb rendering it liable to be broken by wind or by the weight of the fruit that may still be produced. As far as could be learned from a personal examination of a number of orchards, the disease is contagious and spreads rapidly. No variety seems exempt from an attack and the age of the tree seems to make little difference. The disease was first observed by growers about four years ago, but no steps were taken to investigate it. It has now become very serious. Photographs have been taken of specimens of the disease and they are reproduced here to enable growers to recognize the malady. They are requested to communicate news of any outbreak so that the extent of the trouble may be ascertained. The disease is now under investigation.

PEACH LEAF CURL (*Exoascus deformans,* [Berk] Fuckel).

As the name indicates, this is mainly a disease of the leaves. It does, however, attack the young twigs to a considerable extent and the flowers and young fruit occasionally. On the leaves, the effect of the parasite is to cause a marked increase in the soft tissues between the veins and especially on the upper side. Since the veins themselves do not lengthen we find that a characteristic curling and puckering of the leaf takes place to accommodate this tissue. The deformation may consist of only one or two small blister-like spots or it may involve the entire leaf, which also becomes as a whole enlarged and thickened. The colour of the attacked areas is at first a darker green, then reddish, and finally yellow or brown and the leaves fall away prematurely. The new foliage put forth will escape attack but the loss of the early leaves weakens the tree severely and, if at all extensive, the crop is either lost altogether or is of inferior quality. The disease is noticeable very early, in fact just as the young leaves are unfolding.

On the twigs, swellings and distortions are produced and the twig often dies. It was at one time supposed that much of the disease on the leaves was due to the fungus

living through the winter in these affected twigs and growing out into the leaves the succeeding spring. It is now known, however, that the mycelium very rarely lives over and that almost all infection takes place from outside as the leaves unfold.

The relation between this disease and climatic conditions is well known. The severity of an attack is much increased by cold, damp weather at the time the buds are bursting. The slower the development of the leaf, the longer it is in getting beyond the susceptible stage, whilst excess of moisture in the tissues also seems to directly favour the fungus.

Control.

There are few diseases which respond so readily to proper spraying treatment. It has been well established that one application of a suitable spray-mixture completed before the buds begin to swell, will practically control the disease. For this purpose the lime-sulphur mixture, either the home-boiled or the commercial, is recommended, since it is not only thoroughly effective against the fungus but is also an insecticide.

BACTERIAL BLIGHT OF ENGLISH WALNUT (*Juglans Regia L.*) (*bacterium* [*Pesudomo as*] *Juglandis,* Pierce).

This disease was observed at Agassiz, B.C., in the grounds of the Experimental Farm. Nearly all the walnut trees were affected and the nuts produced were practically all rendered useless. The injury manifested itself on the leaves by the production of more or less large brownish areas of dead tissue; the fruits also showed blackish spots or they had turned quite black. The shell, generally hard in sound fruits, was soft in attacked ones and the kernel had turned black and putrid. Young twigs also showed signs of the disease. They had died back for a distance of about a foot or more, the wood showing a dark centre for a considerable distance, although no external injury could be observed, with the exception of the dead tips.

The disease was first investigated by Pierce in Southern California. It is of no little interest to have observed the disease at Agassiz, where it has prevailed for some years. These trees were imported some twenty years ago from France and made quite a satisfactory growth until some years ago when this bacterial blight appeared. In Southern California, the disease caused serious alarm among the growers, who, at one stage of this disease, offered a reward of $20,000 for a satisfactory remedy, which is another instance of the serious economic importance of plant diseases. The English walnut may easily be grown in the Pacific coast regions as well as in the Niagara district, and the attention of the growers is directed to this outbreak which, in the aspect of its severity and in its cause, is identical with the Californian disease. Trees that have been attacked should be carefully pruned, all dead wood being removed and burned immediately. According to Dr. E. F. Smith, copper fungicides have been found useful in its control, and periodical spraying should be practised.

DISEASES OF SMALL FRUITS.

ANTHRACNOSE OF RASPBERRY AND BLACKBERRY (*Gloeosporium Venetum,* Speg).

This disease is found on the canes, leaf-stalks, and leaves. It is, however, on the canes that it is most serious. Here it produces purplish spots, which, as they extend, become greyish and depressed in the centre with a reddish border. When the attack is severe, these spots may coalesce in such a way as to 'girdle' the cane, which then withers and dies. Even where the injury is less marked, the conduction of sap may be

so interfered with that a crop of fruit cannot be matured. On the leaves, small but similar spots occur which often fall out, leaving a perforation. When the leaf-stalks or leaf-veins are affected, the leaf may develop in a one-sided manner and the margins are often inrolled. The spores are produced in masses in the centre of the older spots.

Control.

Treatment consists in going over the plantation as soon as the fruit is picked, cutting out the old canes and any diseased new ones, and burning them. When the disease becomes very bad, a new plantation of healthy shoots must be set out. Spraying with Bordeaux mixture to protect the young canes is sometimes recommended but it is doubtful if it is worth while.

FROST INJURING FLOWERS OF STRAWBERRIES AND RASPBERRIES.

Practically no year passes without our receiving from fruit-growers, during the time of flowering of raspberries and strawberries, a number of inquiries relating to the cause of what is popularly called 'black heart' of strawberry or raspberry flowers. The cultivated varieties of these plants are more or less subject to frost injury, which manifests itself by producing a blackened centre in these flowers. In severe cases, all flowers forming a cluster may be found affected, especially in varieties where most of the blossoms open at one time. Night frosts are capable of great injury by destroying the styles of the flowers and thus preventing the fruit from being formed. In some instances, a few styles only may be killed and the result will be a crippled, malformed fruit, which does not recommend itself by its appearance to the buyer. It has been found, especially in the case of strawberries, that the injury may be largely prevented by covering all early-flowering varieties at nights with straw or loose litter of some kind. The harvest may thus often be increased from ten to twenty per cent and more. Raspberries may be planted between sheltering hedges, or they may be covered over night with cheese cloth. Where these suggestions may not be practicable, spraying with cold water early in the morning before the rays of the sun take effect has been proved a useful preventive.

The lighting of smudge fires and keeping them alive throughout cold nights has also proved quite successful.

LEAF SPOT OF STRAWBERRY (*Mycosphaerella Fragariæ,* [Tul.] Linden).

This is the commonest disease of the strawberry, and is very frequent on both wild and cultivated plants. The spots are of medium size, and show first as a rather indefinite, reddish or purplish discolouration. Later, the dead centre of the spot becomes whitish or ash-coloured and is surrounded by a rather indefinite area of varying shades of red or purple. They often coalesce to form large blotches. During the summer months, spores are produced on the surface of the pale central portions, and these, under suitable conditions of moisture and temperature, serve to propagate the disease throughout the growing season. During the winter a second form of spores develops within the dead tissues of the leaf, and these are scattered in late winter or early spring. The injury consists chiefly in the destruction of so much leaf tissue and consequent malnutrition of the fruit, but the development of the latter may be more directly affected by the fungus attacking the fruit-stems.

Control.

In making a plantation use only healthy plants. Any spotted leaves should be picked off and burned. The first season, spraying with Bordeaux should be begun before the blossoms open and the plants kept covered with the mixture through the growing season. The second year, spray before blossoming, and after the fruit is picked either spray again or mow and burn the leaves. It is generally recommended to crop strawberry plants for two seasons only and then plough them up. By this method, the beds can easily be kept clean and free from disease and weeds.

DISEASES OF POTATOES.

PREVENTION OF POTATO SCAB.

This experiment was undertaken to show the comparative values of the different treatments generally practised to prevent 'Potato Scab.' It has been our experience that in some years the treatment has no effect whatever; it is also known that badly scabbed potatoes planted on new land may produce a perfectly sound crop. Sound tubers planted on land that has previously borne a badly scabbed crop may be found to produce sound tubers. On the other hand, sound tubers planted on soil perfectly new and never used previously for potatoes may give rise to a badly scabbed crop. These peculiarities clearly indicate that potato scab is influenced by climatic and soil conditions. In order to show the value of the treatment generally recommended these experiments will be carried on every season for some time, when it is hoped to prove which treatment is the most reliable one, if indeed any is to be recommended at all.

The potatoes used were uniformly, but not badly, scabbed and of the same source and variety. They were divided into four lots of three pounds each and subjected to the following treatments:—

Lot I.—Untreated.

Lot II.—Soaked three hours in a solution, 10 oz. Carbonate of Soda in 10 gallons of water.

Lot III.—Soaked three hours in a solution, 1 lb. formalin in 30 gallons water.

Lot IV.—Soaked three hours in a solution of Corrosive Sublimate in water, 1 in 2000.

Each lot of tubers was then cut for seed and was planted on June 4, 1910. The tubers were planted in hoe-made furrows about three inches deep. The land had grown potatoes which were quite sound the year before. Stable manure was applied uniformly over the plots when the land was being prepared.

RETURNS FROM TRIAL PLOTS CALCULATED PER STATUTE ACRE.

Lot.	Treatment.	Scabby tubers.	Sound tubers.	Total.	Percentage of Scabby Tubers.
I.	Untreated	90⅔ bush.	74⅔ bush.	165⅓ bush.	54·8%
II.	Carbonate of Soda...	96 "	80 "	176 "	54·5%
III.	Formalin......................	53⅓ "	85⅓ "	138⅔ "	38·4%
IV.	Corr. Sublimate.....	85⅓ "	74⅔ "	160 "	53·3%

Sixteen bushels have been considered to be planted on an average per acre. The legal weight per bushel of potatoes, *i.e.,* 60 pounds, has been taken in making these calculations. Thus it would appear from the above table that the Carbonate of Soda lot yielded heaviest and the Formalin lowest, the latter, however, reducing the liability to scab considerably. The other treatments seem to act alike with the untreated ones. We are by no means satisfied to recommend the Formalin-treatment for scab from our results obtained. Various conditions may have influenced the growth of potatoes and have resulted in a comparatively large reduction of the yield of Formalin-treated tubers. It will be interesting to see the results obtained by next season's experiments on the identical lines. This table again proves that no reliable conclusions can be drawn from a single experiment.

INTERNAL SPOTTING OF POTATO TUBERS.

(Plate II. b).

Attention has been paid during the year to samples of a potato trouble received from various sources. The potatoes appeared perfectly sound externally but showed on cutting them, towards the stem end, a curious brownish ring consisting of a large number of isolated, minute specks corresponding to the vascular system of the tubers. On peeling the tubers rather thickly, the brownish discolouration became apparent in narrow, branching streaks. Microscopical examination revealed that only the vascular bundles of the tubers were discoloured. In no case did this discolouration extend to the other end of the tuber. Its appearance is quite different from the Fusarium Rot, (*Fusarium oxysporum*), with which it is generally confused. In this case, the appearance of the discoloured portions, though within the region of the vascular system, extends into the tissues surrounding these bundles and the discolouration also appears rather blackish or sometimes bluish-brown. Microscopical examination also invariably reveals mycelial threads of a fungus within these tissues.

Some of the spotted tubers were planted on plots on the experimental ground and the plants were watched throughout the season. No difference was noticed in the case of the plants developing from the affected tubers from plants grown from selected sound tubers. On harvesting the tubers, they were found quite free from any sign of spotting and they were quite normal as regards yield. A single tuber was raised in sterile soil and behaved in the identical manner—the tubers produced showed no discolouration. Potato tubers similarly affected were again sent early in spring to ascertain whether they could be used for seed. Our experience has shown that such tubers may produce a sound crop, but is limited to one year only. We would not advise in any case the purchase of affected potatoes for seed. Some physical condition may set in, which may change this aspect considerably. Farmers are advised, when buying potatoes for seed, to cut a thin slice off at the stem end,—should any discolouration become visible, the tubers should not be used. The matter of these discoloured tubers was discussed with some plant pathologists of the United States. They also have observed identical cases and confirm our observations as regards the absence of any micro-organism. 'Apparently,' one observer states, 'the spots are due to the collapse and death of the tissues from undue withdrawal of moisture.' In the experience of the American investigators, this phenomenon is identical with the rust-like spots of collapsed tissues frequently observed in potato tubers. This spot is also well known in Europe, where it has received the names 'Sprain' (England) and 'Eisenfleckigkeit' (Germany). The microscopical observations of the diseased tissues recorded in the various European countries agree with those on this side of the Atlantic, and nearly all observers agree that the phenomenon is a physiological one. The microscopical appearance, especially of some of the spots observed, very closely resembles the so-called Baldwin Spot or Bitter Pit of apples. The most recent investigation of this trouble appears to have been made by A. S. Horne (Ann. Myc

vii. p. 286) who considers that it is caused by a 'chytridiaceous endophyte hitherto undescribed.' Mr. Horne's note is preliminary and has not at present advanced our knowledge to any degree. It remains to be seen whether the organism will present itself again and to other observers. At present the only suggestion that may be made is the selection of varieties that remain free from any spotting of the described kind. Affected tubers have again been secured and have been planted this season. The results will be published in our next report.

LEAF SPOT OR LEAF BLIGHT OF TOMATOES (*Septoria Lycopersici,* Speg).

This disease is distinguished from others attacking the tomato crop by the characteristic 'spotting' it produces. The spots are small, numerous, often angular, with a dark border, the centre becoming paler with age. On the upper surface of the leaf, in the centre of the older spots, will be found the minute fruit bodies, black when mature. The disease begins on the tips of the lower leaves and gradually extends to the younger ones and to the stems. Badly attacked leaves wither up and fall away and the crop is seriously injured, the fruit often failing to set. The fungus probably passes the winter in the crop refuse in or on the soil. We have also observed the occurrence of these spots on the stem, petioles and unripe fruits of tomatoes.

Control.

Spraying with Bordeaux mixture is quite effective. The first application should be made before transplanting. Subsequent applications should be made often enough to keep the foliage protected and until there is danger of staining the fruit. The chief difficulty is to do the work thoroughly with unstaked plants under field conditions. It has also been found very useful, when planting out young tomato plants to dust a little powdered fresh lime into the hole and around the plants.

ONION MILDEW (*PERONOSPORA SCHLEIDENI,* UNG.).

This is a common and destructive disease of the onion crop. Although we have not received many inquiries about it during the past year, yet it is capable of becoming such a serious enemy of the onion grower that we think it advisable to give a short account of it.

The disease may appear as early as June, but occurs usually later. It is detected by the spore-bearing branches of the fungus giving rise to a velvety or furry appearance on the surface of the leaf, together with a purplish colour. Later on, the leaf collapses and withers or rots away. Summer spores are produced in great numbers and, under favourable conditions, especially wet weather, the disease spreads very rapidly. If the plant is young when attacked, it will succeed in producing another crop of leaves and, if these can be saved, a fair or even a good yield may be obtained, but if nothing is done these later leaves meet the same fate as the earlier ones, and the plant is either killed outright or the yield seriously reduced. Another kind of spore adapted for carrying the fungus over the winter (*oospore*) is produced in the tissue of the dead leaves and these resting spores, by the rotting of the leaves, are set free in the soil, or in the manure heap if any of the crop refuse is carelessly thrown there. From these spores comes the first infection of the succeeding year.

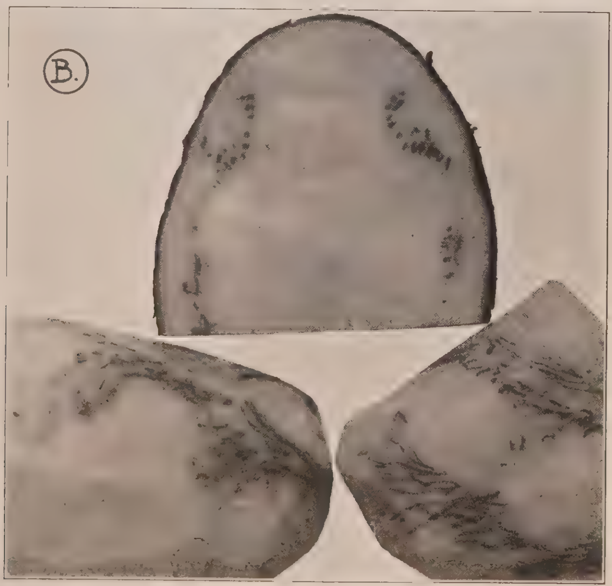


Fig. A. Branch of Plum showing three "Bladder" Plums on the left.
Fig. B. Above, section through one half of Potato tuber, showing "Internal spot". Below, some cuttings of Potato tubers showing "streaky" discoloration after paring.

A. "Club Root" of Turnip caused by *Plasmodiophora Brassicae* Wor. B. "Black Knot" of Plums and Cherries (*Plowrightia morbosa* (Schw.) Socc.)

Control.

From what has been said above, it will be readily understood that complete destruction of the refuse of the diseased crop is very desirable. In any case, contamination of the manure should be avoided since the resting spores retain their vitality for a long time. Rotation of crops is also important, the disease being most destructive in regions given up largely to onion growing. In addition, spraying with Bordeaux mixture has been successfully carried out, beginning preferably before the disease makes its appearance. Owing to the smooth, polished surface of the onion leaf ordinary Bordeaux mixture does not adhere satisfactorily, and it is necessary to use Resin Bordeaux, which is made up as follows: Boil two pounds of resin and one pound of sodium carbonate (sal soda, washing soda) in one gallon of water till the mixture is of a clear brown colour. Add this mixture to each forty gallons of standard Bordeaux mixture. It may be mentioned that the addition of one pound of resin and one-half pound of sal soda, boiled in one-half gallon of water to forty gallons of Bordeaux mixture, will greatly prevent this mixture from being washed off by rain.

ALFALFA LEAF-SPOT (*Pseudopeziza Medicaginis* [Lib.] Sacc).

This trouble, known as 'rust' and 'blight' is a very common and widely distributed disease, being generally present in a greater or lesser degree wherever alfalfa is cultivated. While frequently of little or no importance, it may become serious by causing an extensive loss of leaves, especially in dry seasons. The disease appears first on the lower leaves and gradually spreads to the younger ones. An affected leaf shows a number of small spots and, if these are numerous, the whole leaf soon turns yellow and falls away. The spots are brown or blackish in colour and circular, but the margin is not very clearly defined. The first cutting is not usually affected to the same extent as the later ones. Young plants, however, may be so severely injured that the crop is destroyed, whilst in any case the loss of leaves reduces the yield of hay directly and also by reducing the growth of the plants.

Control.

No very satisfactory means of dealing with the pest under field conditions is at present known. Where the disease appears severely early in the season, it may be advisable to cut the crop at once. The subsequent growth of the plants in such a case may escape the disease. Diseases attacking crops which are grown on so large a scale that spraying becomes impracticable, as for instance rust, smut, alfalfa leaf-spot, etc., are not readily prevented. In small plots, one may succeed in preventing and even checking diseases by various methods, but these cannot possibly be employed in large areas under crop. This procedure would be far too laborious, and hence too expensive to be practised on a farm. But the farmer may, with comparative ease, select from any diseased crop one or more plants practically free from attack and save seed from these for propagation. If he perseveres in this manner he may ultimately secure a plot of disease-resisting plants, from which he finally may raise all the seed he needs for field sowing.

CLUB ROOT OF CRUCIFERS (*Plasmodiophora Brassicae,* Wor).

(Plate III. a).

During the past year, specimens of cabbages and turnips attacked with this disease have been sent in from Nova Scotia, New Brunswick and Prince Edward Island. Our records of its occurrence in the Dominion are confined to these provinces but it is highly probable that it occurs elsewhere, Ontario farmers having inciden-

tally described an affection apparently of this nature in certain localities. This is not surprising when we consider that it is particularly bad in the eastern United States, *e.g.* in the neighbourhood of Buffalo, not far from the Canadian boundary. Since the disease is at present comparatively restricted in its occurrence and at the same time very characteristic in its appearance we here give an account of it in order that farmers and others may guard against its introduction and also that we may, if possible, obtain more information as to its distribution. We shall be particularly glad to receive suspected specimens or answer inquiries to these ends.

Appearance and Cause.

Many kinds of cruciferous plants are liable to suffer from this disease. Amongst cultivated plants, the different varieties of cabbage, turnip, cauliflower and Brussels sprouts are subject to it, and amongst weeds such common ones as Shepherd's Purse, Hedge Mustard and others. The names given to it are more or less descriptive of the character of the malformation induced *e.g.* club-root, club-foot, clubbing, finger-and-toe, and others of similar significance in other languages. In England it is often known as 'anbury.' The cause of the disease is a minute parasite which invades the tissue of the root system probably by means of the root-hairs. Inside the host, the organism causes the enlargement and division of the attacked cells with the result that swellings of various forms appear. The whole root system may be converted into an irregular, knobbed mass, or the principal roots may retain their distinctness but become much thickened, these different appearances having prompted the different names already alluded to. So far as is known only the root system is attacked. The effect of this abnormal growth is to seriously interfere with the power of the root to absorb the water and other soil constituents. Attacked plants 'flag' or wilt and either die or only reach a very imperfect development. Ultimately the swollen portions become invaded by other organisms and the plant substance is reduced to a rotten mass, which gives off a very offensive odour. In the meantime, the parasite has changed into enormous numbers of minute resting spores which become in this way distributed through the soil. These resting spores finally germinate and give rise to exceedingly small active spores which again enter a suitable host plant. Although there is no evidence of the organism being able to attack any part of the plant except the root, it is thought the disease may be carried into new localities on the seed. A little consideration will show that surface soil contaminated with the spores may readily be blown on to the seed pods, and then get on to the seed during the threshing of the pods.

Control.

Great care should be taken to avoid the introduction of the disease into localities where at present it does not occur. Seed should, if possible, be obtained from a source known to be free from the disease. If seedlings are purchased they should be carefully examined before planting, and if any infected plants are found, not only should these be destroyed, but it would be well to discard them all, since the adhering soil may contain spores enough to contaminate healthy ground. The spores are said to resist the digestive juices of animals and, if diseased plants are fed to stock without being cooked, the manure is likely to prove a prolific source of new infections. The spores set free in the soil may retain their vitality from three to seven years so that a rotation which brings a cruciferous crop on the land not more than once in that time may be necessary. The destruction of weeds is important since a number of these may become infected and harbour the disease from year to year. Where the disease has become established, applications of lime every few years are of great value in diminishing the severity of the attacks. These should be at the rate of two to three tons per acre and made some little time, preferably a year or eighteen months, before the sowing or planting of the cruciferous crop.

DISEASES OF ORNAMENTAL TREES AND PLANTS.

LEAF SPOT OF ELM (*Dothidella Ulmea,* [Cchw.] Ell. & Ev.).

This is a very common trouble, confined to our elms, both native and cultivated, and, in severe cases, causing extensive premature defoliation. The disease generally attacks the leaves and shows itself as a grayish area of dead tissue in the centre of which from one to several black spots are to be found. These latter are the young fruit bodies and during the winter, as the leaves lie on the ground, the spore-sacs or asci develop within them. The spores mature in the spring and give rise to the first infection of the elm leaves.

As a means of controlling the disease, it is recommended to collect and burn the fallen leaves in the autumn so as to prevent the formation of a crop of spores from them in the spring.

A row of young elms imported from France, growing in a nursery not far from the Experimental Farm, was found to be infected by this common disease. It was here plainly observed, however, that the fungus is not exclusively confined to the leaves, but does also occur on the petioles of the leaves from which it spreads to the tips of young shoots, which twist downwards and are finally killed. The elms were carefully kept under examination, but in no case did an attacked twig make a recovery, Removing and burning these twigs where they occur would protect the trees from becoming crippled.

BLACK SPOT, TAR SPOT OR LEAF BLOTCH OF THE MAPLE (*Rhytisma Acerinum,* [Pers.] Fr).

The leaves of various species of maple are often affected with large black spots, which may injure the leaf so much as to cause it to fall. The behaviour of this fungus is much the same as the Leaf Blotch of Elm, and the same treatment is advised should it become serious enough to merit attention.

ROSE RUST (*Phragmidium subcorticum,* [Schrank] Wint).

In the earlier part of the season, the rust shows as bright orange-red spots on the leaves, petioles and stems. Later in the year, these give place to spots of a dark-brown or black tint and are composed of the resting spores. This disease is rarely serious and no control measure can be recommended as likely to give satisfaction.

Other parasitic fungi whose occurrence may be here recorded, are *Entomosporium mespili,* (D.C.) Sacc., on English Hawthorn from Nova Scotia; *Dasyscypha Willkommii,* Hart, from Nova Scotia; and *Lophodermium nervisequum,* (D.C.) Rehm, on *Abies sp.* from New Brunswick.

HOLLYHOCK RUST (*Puccinia malvacearum,* Mont.)

This is a very common and destructive disease of the Hollyhock, which also attacks other plants of the same family, being particularly abundant on the common round-leaved Mallow (*Malva rotundifolia,* L.). It is sometimes difficult to find an individual of this last species with leaves entirely free from the pustules of the disease. While most of the best-known rust fungi pass through two or three well-marked stages in their life-history, in this case only one is present, this being the teleutospore stage, or, as it would be termed in most forms, the resting spore stage. Unlike most spores of this type, however, those of the Hollyhock Rust do not require to rest or to be

exposed to winter conditions, but germinate at once, and serve to propagate the disease throughout the season. While other parts of the plant may suffer, the effects are usually most pronounced on the leaves. When infection has taken place, the leaf tissue in the immediate neighbourhood becomes changed to a bright yellow colour, which at first glance resembles the early fruiting stage of some rusts, *e.g.*, Rose Rust. Later, in these areas will be found little raised masses of a chocolate-brown colour, which are pustules of spores. Often these are so numerous that the leaf tissue is almost all destroyed with the result that the plant dies or produces a very poor show of flowers.

Control.

One of the most essential steps in the control of this disease is the eradication of all mallow plants in the vicinity of hollyhocks, otherwise the former will serve as a continual source of new infections. The remains of attacked parts of the plants should be burned, as the spores may live through the winter on such rubbish and germinate the following spring. Where the plants are few in number and grown for ornamental purposes, a careful watch should be kept as the young leaves come out, and infected leaves picked off as the pustules appear. This will prevent much later infection. Spraying with Bordeaux mixture, beginning as early as possible in the season, and repeating often enough to keep the new leaves covered, is effective but disfiguring where plants are grown for ornamental purposes. The fungus, as stated in a recent publication on the subject, is also carried on the seeds or bracts and develops when such seeds are being sown. The hollyhock is a much favoured old-fashioned garden plant and as it is a remarkably free-blossomer, easily grown, care should be exercised to prevent this disfiguring rust from attacking the plants.

PART II.

AGRICULTURAL BOTANY.

During the year, a considerable amount of the time of the Division has been claimed by those branches of botany relating to the higher plants. The usual number of weeds has been received for identification and advice upon means of eradication; and each inquiry has been dealt with as fully as was possible with the often limited information given us. In addition to these, and many other wild plants sent in small numbers, about thirty collections, with an average of fifteen plants in each, have been named for correspondents. Other inquiries have related to poisonous plants, and cases of suspected plant poisoning; or to medicinal plants, and plants supposed by the senders to be of medicinal value. A great many specimens, for instance, are sent with the request to know if they are ginseng, though, curiously enough, only one received during the year has proved to be that coveted species. Quite a number of correspondents have asked for information about various special crops like broom-corn, hemp, rape, ramie, mint, etc., and we have been frequently consulted about the values of different grasses and clovers, the seeding down of wet meadows, sandy loam, lawns, etc., and similar problems.

The work on the Herbarium of the Division has also been continued, over five hundred sheets being added this year, partly of material collected earlier by Dr. Fletcher, and partly of collections made during the summer months at Ottawa, and during my trip through the West in July and August. The collection has thus been made considerably more complete as regards the Canadian flora, for among these

specimens were many species not before represented. Since the establishment of the Division of Botany (July, 1909) close upon two hundred species have been added to the list, which was even at that time a creditable one. Vacancies still remain to be filled in, and some genera are far from being complete, but the deficiencies are now mostly of the rarer plants which happily are also less likely to be consulted. In some genera, recent revisions and advances in nomenclature have made a great deal of re-naming necessary, and some time was found for a beginning of this important work with Carex, some of the grasses and other plants. A set of Ottawa hawthorns collected by my colleague, Mr. Groh, and submitted to Mr. W. W. Eggleston for critical study, has been added to the Herbarium. These specimens in flower and fruit were taken from over sixty trees in the immediate vicinity of Ottawa, and represent fifteen species and varieties of this perplexing genus. A similar collection of June-berries (*Amelanchier*) was also made, which provides material for a fairly exhaustive study of this genus as it occurs in the vicinity of Ottawa. The Herbarium is always at the service of any student of botany, and may be consulted daily during the official hours. Together with the Arboretum and Botanic Garden, the Herbarium affords exceptional facilities for the study of Canadian plants.

It becomes here my pleasant duty to acknowledge and thank Mrs. Wm. Saunders for the very generous contribution of upwards of one thousand sheets of mounted plants to our collection. The plants were mainly collected by the donor herself, and their careful preservation, together with the requisite data furnished, speak well for the great care with which they have been collected. They are greatly appreciated and form an important and welcome addition to our Herbarium.

ARBORETUM AND BOTANIC GARDENS.

It was the desire of the Honourable the Minister of Agriculture, that the control and management of the Arboretum and Botanic Gardens adjoining the Central Experimental Farm be transferred to the Dominion Botanist, the transfer to date from January 1, 1911. The Gardens have hitherto been in charge of Mr. W. T. Macoun, Dominion Horticulturist, who at the same time acted as Curator. The splendid collection of trees and shrubs in the Gardens is well known and many visitors from near and far spend an enjoyable and profitable time in the study of its vegetation. In past years, however, there has been no desire to make a Botanical Garden in the true and wide meaning of the term, the grounds serving mainly as a trial ground for ornamental trees and shrubs, deciduous and evergreen, arranged according to pleasing landscape effects or floral displays. Institutions like the Experimental Farms, existing for purposes of demonstration and practical application, should base their results upon established scientific facts and for this reason it will be our endeavour to develop a botanical garden for purposes of economic application and scientific study and to serve as a centre for imparting information to the visiting public.

The formation of a Botanic Garden is naturally influenced by the local climatic conditions, which may make completeness impossible even in the representation of our own flora. An important feature of a garden for our purposes should be the display of economic plants such as timber, shade and shelter trees, food and fibre plants, and those of medicinal value. Such plants, plainly labelled with their uses or the uses of their products, will no doubt have an interest with the public, second only to beautiful floral effects. In a country so vast as this, a botanic garden should also illustrate the geographical distribution of plants and their ecology or relation to environment, so far at least as climatic and other conditions will permit. The interest shown by many visitors and correspondents in the development of such gardens, the popularity enjoyed by, and the instruction and benefit derived from existing gardens all over the world, certainly justify any endeavour to improve, extend and render more practically useful the beautiful grounds set aside for such purposes.

Any assistance in making as complete a collection of plants as possible will be much appreciated. Seeds and plants from all parts of the country are much desired, and it is hoped to publish lists of the seeds and plants from the gardens available for exchange.

RHODES GRASS (*CHLORIS VIRGATA*).*

This grass has been brought into prominence during the past year, by glowing accounts of its value to stock owners, which have been furnished to the press by a gentleman from Australia. Many inquiries have come to us as a result of this publicity, so that it seems desirable that the plant should be referred to here. From all that can be learned, Rhodes grass in Australia is evidently worthy of much or of all the praise that is being bestowed upon it, but it does not necessarily follow that it will fill any really important place among our Canadian crops. The climate of the two countries and their agriculture are widely different in many respects. Fortunately, we do not have to rely solely on reports of the superiority of this grass elsewhere, for it has been experimented with for several years in this country.

From 1904 to 1908, Rhodes grass was under experiment on the grass plots at the Central Experimental Farm, Ottawa, seed both from South Africa, its native home, and from Australia being used, as well as a small amount of seed matured here, which, however, failed to germinate. It is a luxuriant annual grass, much inclined to creep by the rooting of the lower nodes of the stems, thus making it difficult to mow.

The yield of forage was quite considerable, and one year was almost equal to that of the best-yielding millets tested alongside it. It is doubtful, though, whether it would give as high an average yield over a series of years as these millets; and it is certain that our sorghums, sugar canes and corn will much surpass it as producers of annual pasturage or fodder. If it will thrive under the dry conditions which obtain in some parts of Canada (and for which conditions it is claimed to be well suited), it will be important to ascertain this fact by further tests in this country; but from all indications it would appear as though our relatively severe climate and short seasons would make it too uncertain a crop to be relied upon. It would not, of course, take the place of any of our regular or permanent pasture plants, which are expected to occupy the land for two or more years. In short it is a grass which may be worthy of further test here, but should not be thrust into prominence until our experiment stations have found it to possess some advantage over the grasses which it is to displace. In the meantime, it will be in order for farmers to make the best possible use of the hay and forage plants which are being recommended, such for example, as that far-too-little grown legume, alfalfa or lucerne.

COMPARATIVE TRIALS OF MILLET VARIETIES.

The value of millet as a 'catch crop' has long been recognized. It may be sown till late in July and will still produce a very satisfactory 'catch.' When it is too late in the season to sow corn, try millet. Its feeding value is nearly that of corn. Millet may be cut before the seeds begin to ripen, when it is well liked by all stock. It is an excellent plant to smother Couch Grass, Perennial Sow-thistle, Canada Thistle and other equally persistent weeds. Millet prefers a sandy soil and thrives luxuriantly on new land. Sow one half-bushel per acre for hay and one peck, (one-quarter-bushel) for seed. The following six varieties have done best in our trials this year:

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* According to information received from Mr. Burtt-Davy, Government Botanist, Union of South Afrca, the grass known in that country as 'Rhodes grass' is a perennial grass (*Chloris Gayana*) while *Chloris virgata* the annual grass is popularly known as 'Sweet grass.' No doubt the latter grass is referred to by the correspondent from Australia. We are much indebted to Mr. Burtt-Davy for a supply of seed of both grasses, which will be carefully tested.

	Sown.	Cut.	Yield per Sq. Rd.	Yield per Acre.		Height of Plants.
			Lbs.	Tons.	Lbs.	Ft.
Cat-tail	June 12	Sept. 17	360	28	1,600	6-7
Black Japan	" 12	" 2	296	23	1,360	5
White Indian	" 16	" 1	248	19	1,680	4
Japan Barnyard	July 13	" 12	240	19	400	3
Italian	June 16	" 18	222	17	1,520	4
Hungarian grass	" 12	" 17	158	12	1,280	4

MUSHROOMS AND TOADSTOOLS.

Considerable interest is shown by some correspondents in the use of mushrooms and toadstools for culinary purposes. These terms are commonly used to describe some of the larger fungi and usually in such a way as to include the edible forms under the title of mushrooms and to designate such as are poisonous or inedible as toadstools. There is, however, no general rule to distinguish a poisonous specimen from an edible one in spite of the many more or less fantastic opinions that have been expressed on this point. It is, for instance, commonly believed that all mushrooms which turn to a bluish colour when cut and exposed to the air are poisonous, whereas this effect is simply due to the oxidation of the fatty matter contained in these particular forms. Likewise no importance can be attached to such indications as the turning black of a silver spoon when dipped in the cooked mushrooms, which is supposed to denote poisonous properties.

The common field mushroom (*Agaricus campestris*) and its cultivated forms are among the most palatable of fungi, though some closely-related ones are highly poisonous. The poisonous principles of fungi can only be established by a careful and difficult chemical analysis, but the collective experience of many individuals in testing the edibility of different kinds by the actual eating of them, has shown the larger number to be harmless and of delicious taste. In consequence of what has just been said, it will be seen that a careful study of the mushrooms is necessary to recognize any particular specimen as useful for food or the reverse. This study needs a little closer attention on account of the risks involved but otherwise does not differ from the methods of acquiring a knowledge of other wild plants. Certain common mushrooms, moreover, are so distinctive in form and appearance that they are easily recognized and a mistake is not possible.

THE COMMON MUSHROOM (*Agaricus campestris*, L.).

The common field mushroom occurs in fair numbers in fields, gardens and open woods. It varies much in size according to the place of growth and time of year. The diameter of the cap may be from one to four inches or more, while the stipe or stem may attain a length of from one to four inches, and a thickness of a quarter to one inch. The cap is hemispherical when young, becoming fairly well expanded with age. Viewed from above, the whole fungus usually appears white, but may be sometimes slightly tinted with red or brown. When turned over, the lower surface of the cap will be seen to be covered with radiating knife-like folds—the gills—which in the early stages may be pale rose but later turn dark-brown, purplish-brown or even black. In this mushroom the gills are never attached to the stipe. The stipe is white and solid, and gradually enlarges towards the base. It generally carries a 'ring' of membranous tissue, formed of the remains of a membrane covering the fungus in its earliest stage (the so-called 'buttons'), which is torn as the fungus grows and the

cap expands. The common mushroom is considered the best of all edible fungi. It is practically the only species that is artificially grown, although other fungi are known which would be easily rivals if cultivated. Those interested in the cultivation of mushrooms are referred to Pamphlet No. 7, obtainable free of charge from the Central Experimental Farm, which contains an admirable account of mushroom culture by Mr. W. T. Macoun, Dominion Horticulturist.

THE FAIRY RING FUNGUS (*Marasmius oreades*, Fr.)

This is still more common, but its excellent culinary qualities are known only to few. It grows generally in lawns or meadows forming more or less regular circles. This mode of growth is responsible for the popular name 'fairy ring fungus.' From the beginning of summer till the snow covers the ground this fungus may be found and, although small in size, its numbers generally make it possible to collect in a short time enough for a meal. The cap measures from half an inch to one and a-quarter inches across. The centre, corresponding to the place of attachment of the stipe, is slightly raised even when the fungus is fully grown and the other part of the cap is expanded. The whole plant is pale ochre in colour. The stipe is rather leathery, one to two inches high and less than a quarter of an inch in thickness. The gills are of the same colour, rather broad, and far apart.

WILD RICE (*ZIZANIA AQUATICA*, L.)

(Fig. 1.)

From time to time, we receive requests for information on the growing of wild rice, and particularly for assistance in securing good, viable seed for sowing. The interest which has been thus shown to exist, and the general lack of success which appears to have been met with, and which has led to these inquiries, has induced us to give some attention to the subject, in the hope of being able to furnish better information than has been available heretofore. Our studies of the problems involved have not proceeded far enough yet to allow of any report on them at this time; but a brief general account of the subject, based on our observations during the last year or two, and on the meagre literature at hand, seems advisable. It should serve to draw wider notice to a little-regarded crop, which is after all, a resource of no mean importance in the natural economy of the country. Such an account at this time and place, may also help to bring us into touch with others who are directly interested in the improvement of wild rice areas, and whose practical observations may be of the greatest value to us in our investigations.

Wild rice as a food for man, holds a place of some importance, especially among certain of the Indians who continue to use large quantities of it, in preference to the cereals introduced by white men. It is said to be a highly nutritious and well-flavoured food which might be utilized to a much greater extent, if the methods of growing, harvesting and preparing it for use were improved somewhat. Whether it will become an article of commerce of much importance remains to be seen. For the present, doubtless, it is of value, less commercially, than as an attraction for water-fowl, and as a means of turning otherwise unproductive lake margins to some account. It is a favourite food of these wild game birds, and its abundance in a locality does much to bring them about in numbers. It is thus of great practical interest to the sportsman and to the owner of a water-front, who appreciates a natural cover combined with the advantages of an eagerly sought-for food for these birds. The advantages will become prominent if any practical steps are taken to improve the condition of the wild rice fields, or to introduce the crop into waters where it does not already grow.

It is certain that there are many places along our lakes and slower rivers which are perfectly suited for the growing of wild rice. All that is required is that the seed should be once sown, when the crop would in future take care of itself. There is one shore of this kind, on the Experimental Farm, which now supports a dense growth of this and other aquatic plants. Formerly, wild rice had not been a part of its vegetation, but the late Dr. Fletcher, a few years ago, scattered a quantity of the seed here, with the result that the plant was soon well established. Similar results should be possible in other places, and yet it is a fact that comparatively few attempts to introduce it are attended with success. The failures may be due to various causes, but probably most of them could be referred to the unsuitable nature of the spots chosen, or to worthless seed.

Wild rice, like every other plant, has its own special requirements, which must be provided if it is to thrive and before we attempt its propagation, we must take the pains to learn what its habits and requirements are.

The wild rice plant is a member of the large family of grasses to which belong all our cereal grains, corn, and most of the forage plants, other than the clovers. It differs from the foregoing from the farmer's point of view, chiefly in being aquatic, and therefore subject to few of the same cultural methods. Botanically, it is known as *Zizania aquatica*, L., and is characterized by its annual habit, the monoecious form of its inflorescence, etc. It is a tall stout grass with stems that are hollow, and divided into compartments by numerous transverse walls. The leaves are long and relatively broad, and are peculiar in having the midrib slightly to one side of the centre. The plants start from the seed in the spring, and by the end of July the large open panicles are fully developed. The lower, broader portion is the staminate, or pollen-producing area, while the upper portion bears the pistillate flowers, and later the grain. This arrangement provides admirably for cross-fertilization, since the pistillate flowers emerge first from the sheath, and receive pollen from other plants before their own is ready. After fertilization, the seed develops rapidly, ripening and dropping in a few weeks' time. The seed is about two-thirds of an inch in length, slender, and bearing awns often two inches in length. Its habit, just mentioned, of dropping immediately upon becoming fully ripe, and lying beneath the water until germination takes place the following spring, gives us probably our most important hint for the proper care of seed which is to be sown elsewhere.

As pointed out elsewhere, one of the principal difficulties in starting new wild rice fields, has been the securing of germinable seed. In order to overcome this difficulty, the United States Department of Agriculture has for some years had investigations under way, which have thrown much light on the subject. It has been made clear that wild rice seed which has once been allowed to become dry, will seldom germinate. Either it must be sown very shortly after it becomes ripe, or it must be stored under conditions which will as nearly as possible duplicate those of nature. The former method has the disadvantage of exposing the seed over winter to the risk of being washed away by floods to an unfavourable depth of water, of getting covered too deeply with mud, or of being eaten by wild ducks, etc. The endeavour has been, therefore, to learn how to store the seed from the time it is gathered until the time for sowing in the spring.

The conclusion reached by the United States Department's experimenters is that wild-rice seed can best be stored by keeping it during the whole of this period in water in cold storage. A temperature of 32° to 34° Fahr. appears to have been the most satisfactory. Seed kept at a temperature of 12° Fahr. and consequently imbedded in ice, was completely destroyed. If cold storage is not available, fairly good results may be had by changing the water in the storage vessels daily until the weather becomes cold. The seed should be got into storage with the least possible delay after it is gathered, and without allowing it to 'heat' or ferment, and drying out must be specially guarded against in the spring when transporting it to the place where it is to be sown.

The selection of a suitable 'field' is another important consideration. Fresh waters, not too stagnant nor yet too rapid, and from one to three feet deep, are usually adapted to wild-rice growth. A soft muddy bottom is also necessary. The mistake should not be made of sowing the seed where the water will recede and leave the young plants under unnatural conditions. If due caution is observed in these regards, and in using seed which has been properly cared for, there should be reasonable probability of success in securing a stand.

The seed of wild rice at from two to three times the price of ordinary white rice. This, it must be understood, is for table purposes only. Germinable wild-rice seed would command a much higher price, especially as hardly any is offered for sale, owing, no doubt, to the difficulty mentioned. A keen interest in the cultivation of wild rice, mainly for food and as covers for waterfowl, is being taken in England, and there is every chance for a grower to ship any quantity to England, providing he takes the necessary care to preserve germination in shipping it.

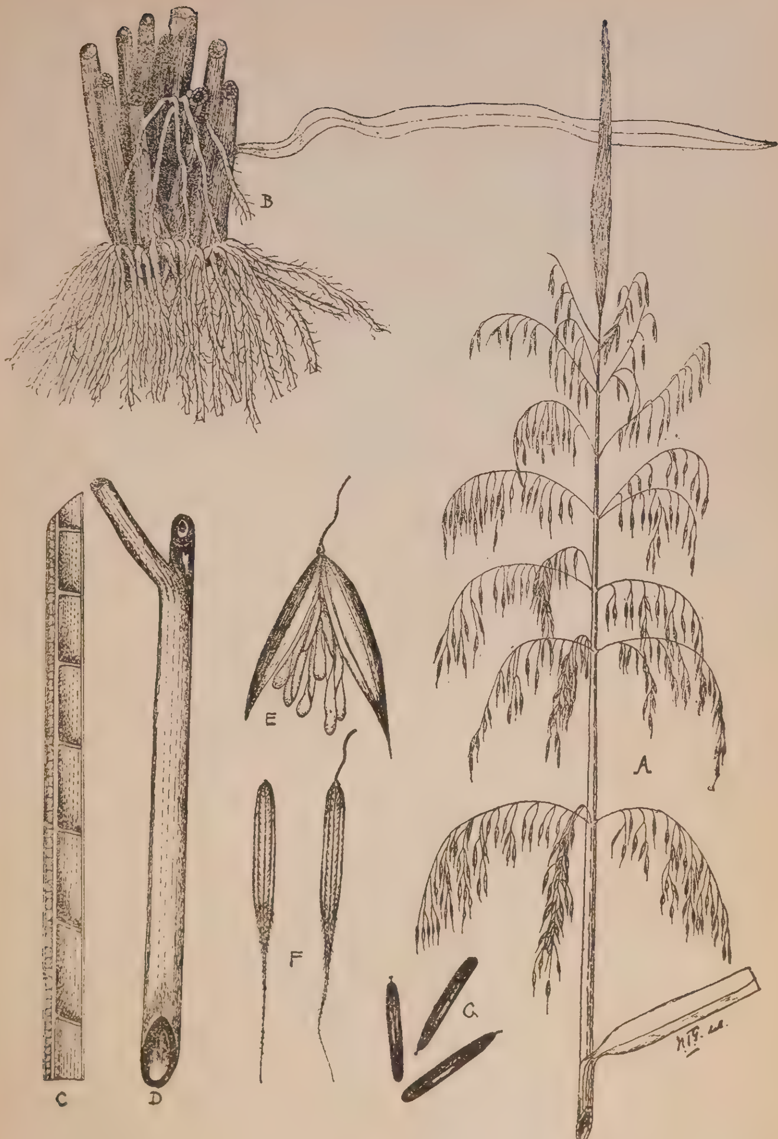

Fig. 1.

Wild Rice (*Tizania aquatica* L.)

A. Inflorescence. B. Base of plant showing floating roots and leaf. C. Section of stem showing separate compartments. D. Portion of stem. E. Male Flower. F. Fruits (nat. size). G. Seeds (nat. size).

PLANTS, POISONOUS, SUSPECTED, OR OTHERWISE INJURIOUS TO LIVE-STOCK.

A number of wild plants occurring in this country possess acrid, narcotic, or otherwise injurious juices, and have, in some instances, caused the death of animals that have eaten them. From time to time, specimens of plants are submitted for examination which have been directly poisonous or at least injurious to the health of stock. While the discriminating powers of adult animals are very pronounced, yet it is by no means rare for young animals to eat plants or portions thereof which may cause great trouble to their digestive organs followed in some cases by death. Among the well-known poisonous plants are the Larkspurs (*Delphinium spp.*) Monkshood (*Aconitum spp.*), Cowbane or Water Hemlock, (*Cicuta spp.*), and Poison Hemlock, (*Conium maculatum* L.), all of which are genuinely poisonous. Other plants like Buttercups, Spurges, etc., though hardly 'poisonous,' contain irritant juices, which have frequently caused injury. In order to put on record any poisonous or otherwise injurious plant, the co-operation of Dr. J. G. Rutherford, Veterinary Director General, has been sought, who has very courteously issued the following circular letter to his inspectors, to veterinary surgeons, and to others interested.

OTTAWA, March 8, 1911.

SIR,—Mr. H. T. Güssow, Dominion Botanist, is desirous of investigating all reported cases of plant-poisoning among live stock in Canada, and has asked me to co-operate with him in this work. I would therefore call your attention to the accompanying note which he has prepared on this subject, and would ask you to be good enough, when possible, to follow the instructions therein set forth in the event of any case of plant poisoning in animals occurring under your observation.

I have the honour to be, sir,

Your obedient servant,

J. G. RUTHERFORD,

Veterinary Director General.

INSTRUCTIONS.

In consideration of the fact that from time to time there have been reported cases of injuries to all kinds of live stock, supposedly due to the poisonous principle in certain plants, it has been thought necessary to call the attention of all inspectors under the Health of Animals Branch, and any persons who may be sufficiently interested in the subject to report any such case of injuries or death of animals, supposedly due to such causes, to the Veterinary Director General and Live Stock Commissioner, Ottawa.

Any such report of ascertained or suspected injury to live stock by plants to be accompanied (stating the age of the dead animals), by as full a description of the symptoms of the animal's or animals' sufferings (loss of appetite, foaming at the mouth or nose, constipation, looseness of the bowels, distended stomach, muscular contractions, rolling, etc., etc.) as possible. Whenever possible, the stomach of the poisoned animals should be sent, that an examination may be made of the contents of the stomach for the presence of any plant or remains thereof likely to have caused the injury. Such specimens should be submitted under strict observation of the following regulations: The stomach should be removed immediately after the animal's death. It should not be emptied of its contents, but where severed from the intestines or other parts it should be securely fastened with a string. The specimens may be packed in ice and shipped in a strong box. By mixing a quantity of finely chopped ice with sawdust a good packing will thus be obtained. In the case of ruminants, the rumen only is needed for examination.

Specimens of any suspected herb, shrub, tree or other vegetation or part thereof should be sent whenever practicable. The specimens may be packed between layers of paper and be sent under cardboard or other protective covering. Any further particulars giving a description of the grounds on which the animals have been grazing previous to death will be useful. Indicate whether the animals had access to ditches, ponds, river banks or whether the grounds were stony, dry or wet, etc.

All specimens should be addressed to the Veterinary Director General, Ottawa, and should contain, in order to be identified, the name and address of the sender. Specimens not exceeding five pounds in weight, after being securely packed to prevent leakage, are carried free by mail. Specimens over five pounds in weight should be sent by express.

Investigations of this kind involve considerable trouble both for the investigator and for the collector of material. It is hoped that farmers will go to the trouble of forwarding specimens of plants and stomachs of animals whenever opportunities occur. This work is done entirely for their benefit and success depends upon co-operation from all quarters.

POISON IVY (*RHUS TOXICODENDRON*, L).

(Fig. 2C.)

It is safe to say that no poisonous plant in America is better known by name, than poison ivy. One would consequently expect to find it also one of the most generally known at first hand, of all our plants, but it is astonishing how many people confess themselves unacquainted with it. Not only townsfolk, but many farmers, and not a few of those who profess to be interested in natural history studies, are unable to recognize it. This being the case, it is not so strange that there are many misconceptions abroad as to its nature, and the precautions to be taken against it.. This should not be so, as the plant is so plentiful in nearly every part of North America, and especially in the east, that almost everyone must have had an opportunity at one time or another, of meeting with it; and as the danger incurred by many people in coming in contact with it is so great, its recognition should be a matter of importance to all.

Poison ivy differs from the majority of poisonous plants in that it does not require to be eaten in order to produce its ill effects. Mere contact with it is sufficient; and indeed many people declare that they are affected even in its presence, though they do not touch it at all. The possibility of ivy poisoning without contact is not admitted though, by those who have studied the nature of the poison to which its effects are due. This poison has been found to be a non-volatile oil, to which the name 'toxicodendrol' has been given. All evidence tends to show that it is a mistake to suppose the poisonous principle can be diffused through the air about the plants. The poisonous substance is found in all parts of the plant, and a very little of it reaching the skin is sufficient to set up its painful irritation. Probably many cases of poisoning which appear to be explainable only on the ground of transmission through the air, might be accounted for by the contact of shoes or clothing with the weed, and then with parts of the body which may not have touched it directly.

It is well known that not all persons are equally susceptible to injury by poison ivy. Some can handle the plant freely without any fear of unpleasant consequences. It would appear also, as if animals were immune, as birds are reported to feed upon the fruit, and my colleague, Mr. Groh, whose observations are very reliable, stated that poison ivy growing along a fence, was kept almost completely eaten down on the one side, where cattle were being pastured. No effects sufficient to attract notice were suffered by any of the animals. (See note next page).

Poison ivy grows most commonly along the borders of fields and woods, by roadsides, or in open woods; or less frequently it occurs in deep woods where it may become a tall climber supporting itself on the trunks of trees. In the open it is low

and bushy, or often climbing or trailing. The leaves are all composed of three ovate, coarsely-toothed leaflets, and serve well as a means of identification. There are no other plants of similar habit in Canada with leaves which would easily be confused with them. The Virginian Creeper (Fig. 2 D) is often held in suspicion, quite needlessly though, as it has five, not three, leaflets, which spread from one point like the fingers of the hand. The poison ivy can also be known when in fruit, by its upright auxillary panicles of whitish berries of about the size of peas.

Measures of eradication must be directed toward the uprooting of the plants, as otherwise any effort to kill them would have to be repeated and continued as long as the roots retain enough vitality to send up new vegetation. It may be advisable to mow off and remove the stems before starting to grub up the roots, so as to lessen the danger of poisoning while at work. The tops may be got rid of also by spraying with a mixture of one-half pint commercial sulphuric acid in one gallon of water. As sulphuric acid is corrosive, it will be advisable to apply with a sprinkling can or an old sprayer which can be sacrificed to the purpose. Obviously too, any work among poison ivy should be done by a person who knows that he is not sensitive to the poison. Every possible effort should be made to remove this nuisance from places frequented by children and others.

It will be desirable to add a word as to the treatment to be given in cases of ivy poisoning. Washing with water alone will not remove the oil, though vigorously scrubbing the parts with soap and water and a brush will help. The most effective treatment is to scrub thoroughly and repeatedly with an alcoholic solution of lead acetate. This brings the oil into combination with the lead so that it can be washed off readily by the alcohol. This remedy should be applied early, as the skin when once inflamed can only be left to heal in the natural course.

Aside from one closely-related plant, the poison sumach, (*Rhus Vernix*), of swamps in western Ontario, we have no other plants which are capable of producing the severe skin poisoning of poison ivy. The stinging nettles (*Urtica dioica* and *U. urens*) and the wood nettle (*Laportea canadensis*) can set up painful smarting of the skin by the contact of their stinging hairs, but their effects are soon over.

NOTE.—Mr. Groh in a letter received after this report was in type states: 'I have recently had an interesting confirmation of my observation that cattle will eat Poison Ivy. The same patch referred to was again pastured down this year and I watched one of our cows last week as she munched the plants off apparently with considerable relish. She has shown no evidence of any resulting inflammation or irritation whatever.'

Fig. 2.

A. Moth Mullein.
B. Common Mullein.
C. Poison Ivy.
D. Leaf of Virginia Creeper.

WEEDS.

An examination of our correspondence shows that among the weeds most frequently inquired about this year are the following: Orange hawkweed, ribgrass, field bindweed, perennial sow-thistle, couch grass, wild mustard, wormseed mustard, rocket, chess, night-flowering catchfly, hop clover and yellow trefoil. It is evident that such a list does not indicate the relative seriousness of weeds. Some of those inquired about have interested the senders because of the difficulty they have had in dealing with them, but quite as many have been sent because they were unknown and thought to be new and possibly noxious or because some feature or other of the plant has caused it to attract attention. In the latter cases it is only necessary to point out the name and nature of the weed, and advise the ordinary measures against weeds practised on all good farms. In other cases, the serious prevalence of a weed, or its persistent character, demands the giving of special instructions for its eradication, and is often a matter of considerable moment to the farmer.

THE MULLEINS.

There are two species of mullein which are weeds of some importance in Canada. The Common Mullein (*Verbascum Thapsus*, L.) (Fig. 2 *b*) is familiar to everyone as a tall, coarse, wooly plant, occurring on roadsides, in pastures, and especially in light or worn-out soils where the grass is thin. It is not eaten by sheep or other animals, (it is not generally known that it contains a poisonous principle), and therefore remains standing even when the pasture becomes quite bare; and in winter its long stems are conspicuous objects wherever it has been growing. The treatment for its eradication consists in breaking up the sod and growing a hoed crop for a year. The land should never be left in sod longer than two years, where it can be included in a systematic rotation. Where it is to be left in permanent pasture, the mulleins may be spudded below the crown while young, or pulled when larger.

A less known, but possibly worse weed, when it becomes common, is Moth Mullein, (*Verbascum Blattaria*, L.) (Fig. 2 *a*). It is appearing in numerous localities and when neglected, soon spreads from the point where introduced. It is more slender, and usually lower than the common mullein, and is not woolly, but smooth throughout. The flowers are rather attractive, about an inch in diameter, and yellow, and are borne in a loose raceme quite unlike the cylindrical spike of the other species. The Moth Mullein, like the common mullein, is a biennial, and the same treatment may be followed in dealing with it.

FIELD BINDWEED (*Convolvulus arvensis*).

One of the weeds which is quietly but very insidiously taking possession of many farms in Canada, and has already made itself known, especially in Ontario, as a noxious weed of the first rank, is Field Bindweed or Wild Morning-glory. We hear more about perennial sow-thistle and some other weeds, which are at the present time spreading more rapidly so as to occasion more alarm, but it is doubtful if any one of them is so difficult to eradicate as this; and its occurrence too, is much more general than has been believed.

Field bindweed is not nearly so well known yet as it needs to be. We receive many specimens of it for identification, and we find that comparatively few farmers know it by name. There is also some confusion between this weed and wild buckwheat sometimes known as black bindweed, which has a similar twining habit. It is important that these two weeds should be distinguished, because the latter while everywhere abundant, is an easily destroyed annual, which need not give serious trouble. Anyone by an examination of the underground parts can satisfy himself of the difference between them. Wild buckwheat has a wiry, slender root which breaks up into many

branching smaller roots, while field bindweed, has an extensive system of white, cord-like, easily broken, perennial roots, which reach deeply into the earth when the subsoil is not too hard. From these roots, freely budding root shoots are produced, and it is by means of these that a patch once started in a field enlarges its area, and it is by their breaking up and distribution as much as by seeds, that new patches are started. It is a matter of common observation that in some localities, the seed is only very sparingly produced, although in others, unfortunately, enough is produced to provide for its constant introduction into new localities through the medium of the clover seed with which it has matured. Besides the differences noticed in the root systems, these two weeds show such dissimilarity in their flowers that they need never be confounded at that stage. The flowers of buckwheat are small and inconspicuous; those of bindweed are over an inch in diameter, white or pinkish in colour, and of the shape and appearance of small morning-glory flowers. The leaves of the two plants bear some resemblances but those of bindweed are blunter at the tip and base generally smaller. The stems in both cases twine about neighbouring plants for support, thus entangling them and dragging them down; or in the absence of any support, they creep about forming a dense mat on the ground.

Immediately on the discovery of the first patch of bindweed in a previously clean field, steps should be taken to prevent its spread, and above all to keep it from spreading to any permanent fence or other obstruction to cultivation. If the area is not already too large, hand cultivation and hoeing will be best, as it can be more thoroughly done and greater care can be exercised to avoid the scattering of pieces of the roots. The aim should be to cut off all vegetation below the surface of the ground, throughout the entire growing season, and as promptly as possible at each new appearance. This may have to be kept up for two or more seasons, depending on how faithfully it has been done. It involves much work, but nothing less will suffice, for every day that new foliage is allowed to spread itself to the sunlight, it is replenishing the lost vitality of the roots.

The difficulty of doing the work is much increased when the area to be cleaned is greater. In this case, field implements must be used, and it is practically impossible to avoid missing some shoots. A broad-share cultivator is the best implement available on most farms, and should be used in preference to the disc-harrow for this weed. If a whole field is infested, it will be economy in the long run to keep it bare-fallow for at least one season, which applies equally to such portions of a field as may be infested. If a late-sown cultivated crop, like turnips or pasture rape in drills, succeeds a year of bare-fallow, the opportunity thus given before and during the growth of the crop, for further cultivation, will do much to subdue the weed. In its weakened condition, it can be smothered with a crop of grain thickly seeded to clover, or better still by a seeding of lucerne without the grain. Any plants which survive must thereafter be given special attention with the hoe or otherwise until disposed of, or the field will soon be as foul as before.

When bindweed gets established in berry plantations, gardens, and similar places, it will usually be best to remove the crop to another location, as very little headway can be made in fighting the weed among them and their supports.

As an alternative to cultivation and the hoe as a means of preventing growth above ground, it is frequently recommended to cover the area to be cleaned with building paper, litter, etc. This, of necessity, can be practised over only very limited areas. Even then it is doubtful whether the saving of labour is sufficient to offset the cost of the treatment. The building paper to be effective must be well overlapped, and in all probability will have to be renewed at least once before the bindweed is subdued. Any other covering must be of considerable depth, for bindweed is capable of growing through a couple feet of straw mulch. Unless there is some special condition which renders these methods desirable, better results may be expected from work such as has been outlined above. Other methods, such as the application of salt or chemicals, have not yet been demonstrated to be of much advantage.

HOP CLOVER AND OTHER COMMON WILD LEGUMES.

Among the plants frequently regarded as weeds, but which are of slight importance either as weeds or for any value which they possess, are several of the wild members of the clover family. Hop clover and yellow trefoil especially attract a great deal of notice, but can hardly be classed as noxious weeds. When present in a hay crop they may reduce the value of the hay by becoming over-ripe and woody, and may affect the yield, to the extent that they occupy the space of larger hay plants; and in clover left for seed, the free-seeding trefoil is also objectionable; but their eradication is not difficult, and they do not show much tendency to over-run regularly farmed land. In pastures they may even contribute enough to the herbage to be of value rather than objectionable. Being rich in nitrogen, and sharing the ability of all legumes to leave the soil richer in nitrogen than they found it, both these plants and also such other legumes as low hop clover, white and yellow sweet-clover, and the vetches may well be encouraged to occupy the ground in untillable places. The hop clovers and the sweet clovers thrive on sandy tracts where grasses are usually insufficient to cover the ground.

When land is to be cleaned of any of these plants, it may be used for a cultivated crop for a year, and if care is taken to prevent seeding they will not persist long as a rule. The vetches may require more attention, by means of a short rotation of crops, after-harvest cultivation, or sometimes seeding down to grass for three or four years, if a rotation is out of the question.

REPORT OF THE POULTRY MANAGER.

A. G. GILBERT.

OTTAWA, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour of submitting to you herewith the twenty-third Annual Report of the Poultry Division of the Central Experimental Farm.

The subjects discussed in this report embrace several new features. One of the most important of these is in connection with the marketing of new-laid eggs and the better quality of poultry to the better advantage of producer and consumer, by means of egg circles, based on the co-operative principle. In several instances, these egg circles have been in successful operation during the past year. Much of their future success depends upon careful and competent management. The rules governing these circles, which are described in the following pages, should be of unusual interest to farmers.

The different subjects treated in this report may be enumerated as follows:—

1. Official figures which show the rapidly increasing value of our home market.

2. A growing, but more exacting, demand for strictly new-laid eggs, and the better quality of poultry.

3. The formation of a Dominion Poultry Association and egg circles in different parts of the country, based on the co-operative principle.

4. The classification of eggs and poultry and the grading of the same.

5. Rules governing the establishment of co-operative associations or egg circles.

6. The experimental work of the past year and results therefrom.

I have to acknowledge the assistance of Mr. Fortier in carrying on the experimental work and compiling the different tables of results which will be found in their proper places. He also acted as judge at the following fairs and poultry shows held during the year, viz., L'Assomption, Sherbrooke, Quebec, Victoriaville, and Montreal, in Quebec; and Toronto and Spencerville in Ontario. He addressed meetings at: St. Valier, St. Adele, Papineauville, Maria, St. Jules, Carleton, Maria Cap, Nouvelle, Bonaventure, Pointe Gatineau, Victoriaville and St. Gilles, in the province of Quebec. He also visited the Experimental Station at Cap Rouge and the Macdonald College at St. Anne de Bellevue, Que. A large and growing correspondence in French demanded much of his time and attention.

Mr. Summers left for England in the month of April last and was replaced by Mr. W. T. Scott, who has had a large experience in poultry keeping in different establishments in Canada and the United States. He has proved himself efficient in the feeding of rations and management of breeding stock during the past winter, as also in securing a satisfactory number of eggs during that season.

Mr. Deavey was entrusted with the care and cleaning of the buildings, the feeding of the young chicks in summer and assisting in the winter feeding of the fowls, etc. His duties were discharged with satisfaction.

I had the pleasure of attending a number of fruit and poultry meetings in the district of Huron, Ontario, during the latter part of May and the beginning of June, of last year, in company with Mr. A. McNeill, Chief of the Fruit Division of the Department of Agriculture. Meetings were held at Lucan, Exeter, Hensall, Brucefield, Holmesville, Aurora, Blyth, Dungannon, Lucknow, Brussels and Port Elgin. Meetings were also attended at Toronto, Cobden, Guelph, Burk's Falls (2), Hanover, Fitzroy Harbour and Carp in Ontario; Montreal (3), and the Macdonald College in Quebec.

A feature of the year, well calculated to show greatly increased interest in poultry keeping, is the large correspondence in both English and French, as shown by the following number of letters which were received and despatched during the year:—

Number of letters received	5,002
Number of letters despatched	6,329

I have the honour to be, sir,

Your obedient servant,

A. G. GILBERT,

Manager, Poultry Division.

REPORT OF THE POULTRY MANAGER.

The rapidly increasing value of the poultry products of the country during recent years has been very marked. This gratifying development of the poultry branch of farm work merits the earnest attention of the farmers of the country to whom it should mean much that is profitable. Some of the principal points in this development may be noted as follows:—

1. The steadily increasing value of our home market.

2. A growing demand, at high prices, for strictly new laid eggs and the better quality of poultry.

3. The adoption of the co-operative principle in the marketing of eggs and poultry.

4. The establishment of egg circles in different parts of the country with the object of collecting and disposing of strictly new-laid eggs with greater despatch than by the usual methods.

5. A marked preference for eggs which are stamped when laid as a guarantee of their prime quality.

6. A greatly increased inquiry on the part of farmers for information as to up-to-date methods in the housing, breeding and feeding of poultry.

POINT I.—INCREASING VALUE OF THE HOME MARKET.

The rapidly growing value of the home market for both eggs and poultry was strikingly instanced by the increased prices of the past winter, during which time fifty cents per dozen were paid to farmers on the city markets, for strictly new-laid eggs and from sixteen to eighteen cents per pound for the best quality of poultry. Mrs. R. A. Craig, of Osgoode, near Ottawa, wrote that she received fifty cents per dozen for new-laid eggs during December and January from a Montreal dealer.

In the grocery and provision stores of this city, higher retail prices were asked and were willingly paid for choice poultry products.

The eggs which obtained the highest prices were not only new-laid, but presented a clean and inviting appearance. They were put up in neat cardboard boxes, on which was printed the name of the party who sent them, and on each egg was stamped the date when laid. Such packages found ready sale.

It is claimed that the egg and poultry trade of the Dominion occupies a position that is actually unique, for while we have decreased exports and increased production we have increased prices. But it must be borne in mind that these increased prices are for the better quality only. The following official figures show the steady decline in the export of eggs and poultry during the past eight years:—

EXPORTS OF EGGS AND POULTRY.

	Value of Eggs.	Value of Poultry and Game.
1902	$1,733,242	....
1903	1,436,130	....
1904	1,053 96	....
1905	712,886	$131,874
1906	495,176	217,944
1907 (9 months)	556,557	157,677
1908	301,818	222,012
1909	124,315	112,579
1910	41,766	....

It will be noticed from the above figures, that the decline in the export of eggs, particularly during the past three years, has been very marked. Speaking of this decline, Mr. John A. Gunn, president of the Montreal Produce Exchange, in a recent address, stated 'that the export trade had declined for the simple reason that, for the time being, the home demand was equal to the country's supply. A paying remedy would be found if the farmer would increase his stock of poultry and carefully study the trade conditions.' It is to be hoped the farmers will put into effect this practical advice.

POINT II. ONLY STRICTLY NEW-LAID EGGS AND THE BETTER QUALITY OF POULTRY WANTED.

There is a rapidly growing demand in the larger cities and towns of the Dominion for strictly new-laid eggs, with the delicious flavour which only such eggs have. For such an exceptionally choice article, the highest values are paid to the producer. This leads to the inquiry, what is considered a choice quality egg? An egg of such a description must fill the following rather exacting conditions, viz.:—

A.—Must not be over four or five days old when offered for sale.

B.—Non-fertilized, so as to prevent possible germ development. This forcibly applies to eggs laid in late spring and during the summer months.

C.—Of fine flavour, which can only be found in eggs laid by well and cleanly fed hens. A hen allowed to eat decaying animal or vegetable substances or drink filthy water is not likely to lay an egg of the finest flavour.

D.—Nutritious in quality and clean and inviting in appearance. If the hens are lice-infested, the lice are likely to get the nutriment which should remain in the egg. An egg laid in a dirty nest is not likely to present an attractive appearance.

E.—Should be collected as soon as possible, after being laid, and be kept in a cool, sweet-smelling cellar or cupboard so as to avoid any possible contamination. The egg shell is porous and the flavour of the egg is easily affected by surrounding substances.

F.—Having such a choice article—as an egg laid under the conditions outlined is likely to be—it is worth while putting them up in neat cases or boxes. Where there are egg circles, it is a rule that the date when the egg is laid be stamped on it as well as the name of the party who sends it.

The same care and effort is necessary in the production of the superior quality of poultry. The producer with well fleshed, carefully plucked and neatly dressed chickens is far more likely to receive a high figure than the seller who has poorly-plucked, ill-coloured, scrawny chickens. The highest price markets of to-day call for a high quality article. The producers who take the trouble to cater to this market obtain the highest figures. Those who have the inferior quality must be content with lower values. The aim of the farmers should be to cater to the highest quality trade. Farmers are certainly in the most favourable position to take advantage of the high prices. Usually they have grain, roots, clover and other articles of feed in abundance and frequently in the shape of waste. At any rate they are available at first cost. No more profitable use could be made of any kind of grain or vegetable waste than by feeding it to poultry.

Speaking of the demand for strictly new-laid eggs in Montreal last winter, a leading dealer in that city remarked: 'While we have great difficulty in supplying the increasing orders of our best class of customers for strictly new-laid eggs at high values, we have hundreds of cases of eggs, just in from the country and called fresh, but we cannot rely on them.' This statement conveys its own moral.

But where are the high prices paid is a question often asked by farmers. Again, the complaint is occasionally heard that the high prices are not received. At a recent meeting of farmers, at which the writer was present, one of the audience said: 'I send only strictly new-laid eggs to the city, but I do not get the highest value.' 'Did you make it plain that the eggs sent by you were of a superior quality?' 'No,' was the reply. The question was then asked, 'How did you send them?' 'Oh, in a crate, just as other eggs are sent.' A great mistake was made in so sending the eggs. There was nothing to distinguish them from other eggs, which are usually stale when they reach the dealer, and are paid for accordingly. Speaking of this phase of the egg trade, the manager of a large grocery establishment in this city said: 'We have no difficulty in selling eggs put up in this way'—taking up a neat cardboard box containing one dozen eggs and bearing the label—'From Henry Nest, Pulletville Farm. These eggs are guaranteed strictly new laid'—and for such a select, neatly put up article we have been paying fifty cents a dozen. At the same time we receive many cases of eggs which are paid for at thirty and thirty-five cents per dozen.' And why make such discrimination? 'Because, as a rule, farmers hold the eggs until they are stale, and when the eggs reach us they are not a first-class article. But when we know the man and the high quality of the goods he sends us, we do not hesitate to pay the best prices.' Later on in this report it is shown where, by the formation of co-operative egg circles, the farmer is helped to place his goods in the hands of the buyers with less delay and trouble than formerly.

PRICES PAID BY LEADING PURVEYORS IN DIFFERENT CITIES.

The interesting and often-times asked query as to when and where the highest prices are paid is answered in the following letters from well-known purveyors in the cities named. It will be noted that 'strictly new-laid eggs' are distinctly specified in most of the letters as follow:—

WALTER PAUL,
461 ST. CATHERINE ST. WEST,
MONTREAL, March 27, 1911.

The Manager, Poultry Department, Experimental Farm,
Ottawa.

DEAR SIR,—With regard to the prices of eggs, I find from my books that from early in November, all through till the end of December, we paid from 50 to 55 and 60 cents per dozen. After the turn of the year, eggs became more plentiful so that prices eased off a little, from 45 to 40 cents. It was not until the beginning of March that prices came to a reasonable figure.

I might add that during the months of November and December we *never get enough of strictly new-laid eggs,* and as you know we are always ready to pay the very highest price for all we can get.

Sincerely yours,
(Sgd.) WALTER PAUL.

GEORGE GRAHAM,
ST. CATHERINE AND DRUMMOND STS.,
MONTREAL, March 25, 1911.

'DEAR SIR,—We are pleased to give you the information that you request, and advise that the best prices which we paid for strictly new-laid eggs, from the beginning of November, 1910, are as follows:—

November 2, 1910, to November 26, 1910, 50 cents per dozen, delivered.
November 26, 1910, to December 23, 1910, 60 cents per dozen, delivered.
December 23, 1910, to December 28, 1910, 55 cents per dozen, delivered.
December 28, 1910, to January 3, 1911, 50 cents per dozen, delivered.
January 3, 1911, to January 19, 1911, 45 cents per dozen, delivered.
January 19, 1911, to January 30, 1911, 40 cents per dozen, delivered.
January 30, 1911, to February 13, 1911, 35 cents per dozen, delivered.
February 13, 1911, to March 13, 1911, 30 cents per dozen, delivered.

Yours very truly,
(Sgd.) GEORGE GRAHAM.

E. J. QUINN, FAMILY GROCER,
WESTMOUNT, March 27, 1911.

DEAR SIR,—Yours of the 24th inst. to hand. *Re* price of eggs during winter we quote: November, 50 cents; December, 60; January, 50, 40 and 35 cents, express prepaid.

Yours truly,
(Sgd.) E. J. QUINN.

LAMB'S MARKET, LIMITED,
22A UNIVERSITY STREET,
MONTREAL, March 26, 1911.

DEAR SIR,—Enclosed find prices paid for eggs as you request:—

1910	Doz.	1911	Doz.
Nov. 14	45 cts.	Jan. 30	36 cts.
" 17	42 "	Feb. 4	34 "
" 22	45 "	" 9	34 "
" 23	48 "	" 12	37 "
Dec. 3	50 "	" 14	32 "
" 8	48 "	" 16	31 "
" 13	50 "	" 21	29 "
" 15	50 "	" 24	29 "
" 20	50 "	" 28	28 "
		" 25	31 "
1911		March 2	28 "
		" 7	27 "
Jan. 2	50 "	" 9	26 "
" 10	52 "	" 14	28 "
" 13	48 "	" 21	23 "
" 24	42 "	" 23	23 "

Yours truly,
(Sgd.) LAMB'S MARKET, LTD.

HENRY GATEHOUSE,

WHOLESALE AND RETAIL DEALER,
MONTREAL, March 27, 1911.

DEAR SIR,—Replying to your favour of the 24th, would say that we have paid the prices set out below for new laid eggs from 1st November last. If there is any further information we can give you we will be pleased to do so.

November and December from 40c. to 45c. a dozen.
January commenced 40c. to 45c.; ended 30c.
February commenced 30c. ended 25c.
March commenced 25c. now from 18c. to 20c.

Yours truly,
(Sgd.) HENRY GATEHOUSE.

POINT III.—ADOPTION OF THE CO-OPERATIVE PRINCIPLE.

It had been long felt that some means of aiding the farmers to sell their strictly new-laid eggs and better quality of poultry to greater advantage, was necessary. Assistance came in the shape of co-operation. A Co-operative Poultry Association, under the title of the 'Poultry Producers' Association of Eastern Canada,' was first formed. In the report of last year the formation of this association is noted as being the first practical step that had been taken in the establishment of co-operation among poultry-men. Later, egg circles were established in different parts of the country. These circles, which are really an outcome of the parent association, promise to become, under proper management, valuable aids to farmers. More is said of them later on.

Such success attended the first association that at the annual meeting, held on the first of February last, it was decided to enlarge the scope of the association and the title was changed to 'The Poultry Producers' Association of Canada.' In the language of the constitution, the object of the association and its branches or circles, 'is to encourage a co-operative spirit among poultry producers; to bring producers and consumers closer together; to encourage the adoption of the best breeds and types of utility poultry; to encourage the small producers to form local branches or circles, for mutual assistance and co-operation in selling; to aid in establishing a uniform and recognized standard of dressed poultry and eggs; to keep the producers in touch with those buyers who put a premium on quality; and to advance and dignify the poultry industry.'

The constitution also provides for proper officers and assigns their duties; arranges for the establishment of branches, circles, meetings, etc., etc.

PART IV.—CLASSIFICATION AND GRADING OF POULTRY AND EGGS.

The part of the constitution that will most interest farmers is the classification and grading of dressed poultry and eggs, from which we take the following condensed information:—

Definition of Terms.

Chickens.—Pullets under seven months old which have not laid and cockerels which have not developed a spur.

Broilers.—Should weigh from one to two and a half pounds.

Roasters.—Should weigh from two pounds and a half upwards.

Fowls.—Hens which have laid, or are over seven months of age.

Cocks.—Male birds having hard spurs. All mature males.

Capons.—Birds caponized when six to twelve weeks old.

Ducklings.—Birds marketed before they are ten weeks old. All over that age, ducks.

Goslings.—Young birds, marketed from seven to twelve weeks of age, before first moult.

Geese.—Older birds, over ten pounds and under.

Turkeys.—Divided into young and old birds, both male and female, and of all weights.

Pigeons.—Squabs or young birds which have not left the nest, usually four weeks old.

Pigeons.—Older birds after they have left the nest.

Poultry, How Graded.

Poultry is graded as follows—

Selects.—Birds which have been specially crate-fattened for three weeks; well fleshed, straight breast bone with fine finish and appearance. Birds of both sexes, but of uniform size, to the number of a dozen, should be packed according to sex, colour of flesh and legs, in a neat case.

No. 1.—A grade lower and should consist of well-fleshed birds of neat appearance. Packed in neat boxes holding one dozen birds of uniform size, sex, and weights.

No. 2.—Is yet a grade lower and is designated as fairly fleshed birds packed in neat boxes.

Common.—Is yet a grade lower and is described as consisting of any birds not conforming to the requirements of the above three grades, *but must not be packed in boxes similar to the other grades.*

In regard to the latter grade, it is a matter of congratulation that less of it is being found on the markets year by year. The day of the scraggy, thin and discoloured chicken is fast passing away. It should be the aim of farmers to bring in for sale no poultry but of the highest quality.

Eggs and How Graded.

Eggs are classified according to quality and are graded as follows:—

Selects.—Are strictly new-laid eggs, not over five days old, weighing not less than 24 ounces to the dozen. Clean but unwashed, of uniform size and colour, packed in substantial, neat cases, having clean fillers.

No. 1.—Are new-laid eggs, but of a lower grade. They should not be over five days old, weighing not less than 21 ounces to the dozen. Clean, packed in substantial and neat cases with clean fillers.

NOTE.—Common eggs, not covered by the foregoing grading, must not be marketed under the brand of the association.

For the ordinary trade, the above two grades of eggs should be sufficient. It is to the higher and not the lower grades that farmers should cater. Rough-shelled and abnormal eggs should not be shipped.

ASSOCIATION RULING ON NEW-LAID EGGS.

What the association rules as a strictly new-laid egg will be read with interest and is described as follows:—

All eggs must be shipped new laid. A new-laid egg is an egg that is *not over five days old when shipped;* an egg that has been gathered promptly and kept in a moderately, dry, cool place (under 60 degrees), free from foul odours and other contaminating influences. On holding a new-laid egg to the light, it will be seen that the air space in the large end is very small. not larger than a five cent piece, and the yolk almost invisible. As the age continues the air space enlarges, and the yolk becomes visible.

POINT V.—RULES GOVERNING BRANCHES OR CIRCLES.

Eggs should be collected every day and twice per day in warm weather, and put away in a clean, sweet-smelling storing place. No diseased birds or birds showing signs of disease shall be offered for sale.

The plant and poultry of members of a circle are expected to be kept clean. Inspectors will visit plants from time to time.

None but artificial eggs should be used for nest eggs. This is important, as it prevents a genuine egg being sat upon by a number of hens in succession.

All male birds should be shut up or disposed of except from January 1 to June 15.

No member is to send eggs except those laid by his own hens.

In case of a complaint by a purchaser against a branch, the manager should be able to trace any misdemeanour to the individual.

The rating of the produce by the manager of a branch is final. All members must submit to his ruling.

SUGGESTIONS FOR THE FORMATION OF BRANCHES OR CIRCLES.

It is recommended that, when necessary, farmers should be instructed as to the value to them and the benefit to the purchasers of placing their poultry products, especially eggs, as quickly as possible on the market. As aids in so doing, the formation of egg circles is recommended.

It is suggested that where there are cheese or butter factories, these factories might be utilized as aids, or the poultry work added to their sphere of action.

It is not advised that too great an area should be included in the operations of a branch or circle.

The system adopted should aim at getting the produce together at a central point which will be convenient and not costly to reach. Members of a circle may bring their own products, or they may be sent for and so collected.

The central point chosen should have convenient shipping facilities, as in the case of many cheese and butter factories. The central station should have a testing room, grading table, store room, etc. Eggs should be graded and disposed of without delay.

The officers of a branch or circle should be a manager, or president, a secretary-treasurer and a committee. All should be competent and business-like men. Much depends upon good management.

The quality of the products is safeguarded by each member of a circle having a stamp with name or branch and number of individual. Eggs and packages of poultry are stamped. Inferiority of product can thus be traced to the producer. The output of each circle bears its own stamp. Eggs should be collected or sent to the central station three times per week.

THE ORDINARY COMMERCIAL GRADING OF EGGS.

The foregoing classification of eggs and poultry according to the stringent rules of egg circles calls for a very select quality of products. This is necessary in order to secure the highest values aimed at. In comparison it will be interesting to note the ordinary commercial methods of grading eggs, as follows:—

GRADING EGGS.

Eggs are sometimes graded as follows:—

Extras.—Weight 28 to 26 ounces per dozen, naturally and absolutely clean, fresh and sound, same colour (a grade seldom used).

Firsts.—Weigh 26 to 24 ounces per dozen, sound, fresh and reasonably clean.

Seconds.—Shrunken, stale, washed, stained and dirty.

Checks.—Cracked, not leaking.

Rots.—Incubator, blood rings, dead germs and decomposed eggs.

All eggs should be bought and sold on this grading system so that an egg will bring what it is worth.

DESCRIPTION OF EGG CONTENTS.

When the candler tests the eggs he bases his judgment on the following indications:

Fresh.—Opaque, appearing almost entirely free of any contents, sometimes dim outline of yolk visible, air cell very small.

Stale.—Outline of yolk plainly visible, sometimes muddy in appearance, air cell very large.

Developed germ.—Dark spot visible, from which radiate light-coloured blood vessels.

Dead germ.—Dark spot, attached to shell, or red ring of blood visible.

Rotten.—Muddy or very dark in appearance, yolk and white mixed, air cell very large and sometimes movable.

Cracked.—White lines showing irregularity in shell.

Testing as above suggested will aid one in determining absolutely the quality of the eggs, not only for marketing, but for incubation.

The farmer should demand that his eggs be bought upon the test. The buyer should co-operate with farmers and meet such demands by buying upon condition that bad eggs be replaced by good ones.

METHODS OF SELECTION.

The methods used for the selection of eggs in the establishment of large egg dealers is called 'Candling' or 'testing.' The 'egg candle' or 'tester' is made of wood or metal, and, as a rule, is kept in a dark room. A light inside the tester shines through an opening, in front of which an egg is held by the candler. By a quick movement of the hand, the condition of the contents of the egg is quickly noted, and the egg is placed in its proper class. A good candler works rapidly and will test a large number of eggs in a day.

It is usual to purchase eggs at a flat rate, but notwithstanding, a buyer frequently goes over them in this manner and selects only the best for his select trade.

TOO MANY DOUBTFUL EGGS BROUGHT TO THE MARKET.

It is to be hoped that the farmers of the country will become members of one of the co-operative egg circles, or be so guided by the foregoing precautionary measures that a better quality of eggs and poultry will be handled by them. Speaking of the

great loss to the farmers every year, by their careless methods of marketing eggs, Mr. J. A. Gunn, of the extensive egg and poultry buying firm of Gunn, Langlois & Co., Montreal, said in a recent address to the Poultry Producers' Association of Canada:—'The loss from marketing bad eggs alone in Canada last year is estimated at $1,850,-000. If eggs had been brought to market in a proper manner the great loss mentioned would not have occurred.' In an article on the 'Poultry Industry' in the Montreal Weekly *Witness* of March 21st last, Mr. E Rhoades of the Macdonald College, Que., remarks:—'The bad egg question must be considered—Let me give reports of two Quebec and Ontario merchants to prove that the loss estimated from bad eggs is not exaggerated. The Quebec merchant states that, during the period from May 15 to October 1, he handles from thirty-five to forty thousand cases of eggs (thirty dozen per case), and that two-thirds of these cases contain no new-laid eggs. The Ontario merchant handles about 20,000 cases of eggs in the same period, and says that with strict candling there would be none classed as new-laid, forty per cent of the whole would be stale or shrunken, and ten per cent bad. These merchants further state that if the bad eggs were eliminated, they could pay from two to eight cents a dozen more for eggs

BAD PRACTICES.

A WARNING CIRCULAR FROM WHOLESALE BUYERS.

The following circular from a wholesale house, who are large purchasers of eggs, to their buyers, conveys its own moral. It it to be regretted that such vicious practices, as complained of in the first paragraph, are so common.

MONTREAL, May 15, 1911.

DEAR SIR,—Already we are commencing to receive bad eggs, which have every appearance of being taken from incubators. We want you to give the question of watching this class of eggs and also bad eggs, close attention from now out.

We understand that already there is a movement on foot among dealers to buy eggs, loss off, just as soon as the warm weather commences, so you want to prepare the farmers and storekeepers for this.

There is another thing to which we want to draw your attention, and this is that eggs are arriving without any packing on the top. This is a great mistake, as it means that we lose lots of money through cracked and broken eggs, which would be eliminated if a little care were used. Kindly give this matter your attention and if you have been guilty, have the difficulty corrected in future shipments.

Yours faithfully,

GUNN, LANGLOIS & CO., LTD.

EXPERIMENTAL WORK OF THE YEAR.

The experimental work of the year commenced on the close of the fiscal year March 31, 1910, when the following breeding pens were made up, viz.:—

Pen No.	Varieties.	Males.	Females.
	House No. 1.		
1	White Plymouth Rocks	1 cock	14 hens.
2	" " "	1 cockerel	13 pullets.
3	" Leghorns	1 cock	28 hens.
5	" "	1 "	14 pullets.
	House No. 2.		
16	White Leghorns	1 "	9 hens and pullets.
18	Barred Plymouth Rocks	1 cockerel	5 pullets.
	House No. 3.		
20	Buff Orpingtons	1 cock	7 "
26	Black Minorcas	1 "	15 hens and pullets.
	Unheated—Cotton Front House.		
32	Buff Orpingtons	1 "	22 hens.
	Other Unheated Houses.		
33	White Wyandottes	1 cockerel	21 "
34	Barred Plymouth Rocks	1 "	29 "
35	" " "	1 cock	28 pullets.
36	White Wyandottes	1 "	20 "

EGGS SOLD FOR HATCHING PURPOSES.

As in the springtime of previous years, there was a greater demand for eggs for hatching than could be supplied. In many instances, eggs were doubtless purchased by farmers, but the great majority of orders were not received from them. It is to be regretted that such should be the case, for the eggs sold from the carefully mated breeding stock to be found in our Division, and the extremely moderate price placed on them, viz.: one dollar per setting, offer exceptional advantages for procuring pure bred foundation stock.

NATURAL AND ARTIFICIAL INCUBATION.

The following table shows the results of hatching eggs by hen and by incubator. A strong point in favour of the incubator is that it is always ready and affords opportunity for the early hatching of chickens where it is desirable and convenient to do so. The hen is not apt to prove an early sitter unless she has been a steady winter layer. If she begins to lay only in springtime, she is apt to lay her full quota of eggs before exhibiting the broody instinct, and that is usually too late in the season to have early chicks of the heavier varieties, such as Plymouth Rocks, Wyandottes, etc. The moral is obvious to those who prefer to use the hen as an early hatching medium, and that is, to have her a steady layer during winter. The fact that eggs are usually of the highest value during the winter season is another strong reason why farmers should have their hens laying during that period. Some interesting particulars in regard to hatching operations will be found in the following table:—

THE ELECTRIC MOTHER.
Chickens hatched and reared by electricity, electrobators and electro-hovers.

Photo by FRANK T. SHUTT.

TABLE II.—SHOWING NUMBER OF EGGS SET AND CHICKENS HATCHED BY HENS AND BY INCUBATORS.

Date when Eggs were Set.	Description of Eggs.	No. of Eggs.				Chickens.		Percentage Hatched.		Remarks
		No. set or placed in incubator.	Clear.	Dead germs.	Broken by hens.	Died in shell during incubation.	Hatched.	Results from total of eggs set.	From fertilized eggs.	
1910.										
Apr. 10..	Buff Orp.; B.P.R.; Wh.Wy.	65	10	5	3	7	40	61½	85	Hatched by hens
" 10..	B. & Wh. P. Rocks; Wh. Leg.; Wh.Wy.; Buff Orp.; B.M.; S. G. D.	169	40	29	....	27	74	43¾	74	" incubators.
" 10..	" "	241	34	54	....	52	101	42	66	" "
May 6..	" "	174	34	6	...	26	110	63	82	" "
" 6..	" "	137	12	8	....	25	92	67	78⅔	" "
" 6..	B. P. R. & Wh. Leg........	69	17	7	3	5	37	53⅔	88	" hens.

It will be noticed from the above table that eggs of several varieties were put into the incubator at the same time.

The spring was late and unusually cold and dry.

To judge from the poor fertility of the eggs from Black Minorca and Silver Grey Dorking fowls, these breeds do not stand the limited confinement of winter quarters as well as others. It will be interesting to note whether the experience of future seasons will justify this deduction or not.

PROGRESS OF THE CHICKENS.

The progress of the chickens from the time of hatching to maturity was most satisfactory. The season was an ideal one after the warm weather set in, and full advantage was taken of the favourable conditions to push the young and rapidly growing stock to early maturity by careful treatment and by regular and generous feeding. An outline of this treatment is given, in response to frequent inquiries as to 'how should chickens be fed and managed?'

First thirty-six hours after hatching.

During this period, the chickens require brooding more than anything else. In a well-hatched and robust chicken, the yolk, which should be completely absorbed, is sufficient food for the time mentioned, or even for twelve hours longer. A mistake is often made by giving the newly-hatched chicks food and too much of it at this early stage of their existence. It may be, in the case of some unusually well-developed chicks that a little food may be desirable, when a few stale bread crumbs may be given.

After thirty-six or forty-eight hours.

Give stale bread soaked in skim milk and squeezed dry, or one part of finely-chopped hard-boiled egg and three parts of stale bread crumbs. Feed no more than the chickens will eat up without waste. If the chicks are hearty, feed every two or three hours. Continue this for a day or two and then add granulated oatmeal. Use the stale bread soaked in milk and granulated oatmeal for ten days, when finely-crushed corn may be added to the foregoing with advantage. After fourteen days, give whole wheat, in small quantity at first.

As the chicks grow older, they should be given a mash composed of stale bread, shorts, oatmeal, ground meat, etc. Finely-cut bone or meat will be found a great incentive to growth at this stage.

On the chicks becoming eight weeks of age, their rations may be reduced to three per day. Care should be taken that they are generously fed the last time for the day.

For drink, give them skimmed milk and water.

When the hen-hatched chickens are fully feathered, their mothers should be removed from them. The chickens will be found to return to their coops as usual, where they may be allowed to remain until removed to more commodious quarters in colony houses.

On the incubator-hatched chickens becoming too large for the brooders, they should be removed to colony houses.

FREE RANGE *vs.* LIMITED RUNS.

When the earlier-hatched chickens were about a month and three weeks old, a group of twelve chickens was taken from among others running in a field and were placed in a pen 10 feet x 8, with a limited run. At the same time, another group of chickens of the same varieties and as nearly as possible of the same age were taken from among the same lot running in the same field, were marked so as to make sure of their identity, weighed and let loose again. At the end of the experiment, the gain was found to be in favour of the chickens confined to limited runs as compared with those running at large. Particulars as to rations, varieties, weights of chickens, etc., are shown in the two following tables.

TABLE III.—SHOWING the gain in weight of twelve chickens as described in the following table, which were taken from a field, specially fed and kept in a pen 10 x 8 feet with a run outside of 10 x 27 feet. Compare this table with table 4 which follows.

TABLE III.—Limited Runs.

No. of Leg Band on Chicken.	Breed.	Cockerel or Pullet.	Age.		Weight.						Remarks.
			Months.	Days.	Beginning of Experiment.		One Month After.		On 1st September.		
					Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
74	Buff Orpingtons............	C	1	20	1	5	2	1½	3	9	The rations were the same as fed to the chickens as shown in the following Table 4, viz.:—Cracked corn and wheat moistened with skimmed milk. The chickens were fed all they could eat.
25	" "	C	1	20	1	6	2	4	3	9	
49	" "	C	1	20	1	7	2	5	3	5	
78	Barred Plymouth Rocks. .	C	1	24	1	13	3	3½	4	10	
81	" "	C	1	24	1	9	2	6	3	8	
61	" "	C	1	20	1	4½	2	3	3	5	
8	White "	P	1	24	1	9	2	8	3	11	
10	" "	P	1	24	1	9½	2	6½	3	10	
82	" "	C	1	24	2	0	3	6	5	5	
64	White Wyandottes....	C	1	24	2	1	3	3½	4	11	
24	" "	C	1	24	1	12	2	11	4	0	
35	" "	P	1	24	1	11	2	7	3	10	
	Total weight........				19	7	31	1	46	13	

Average weight of each chicken at beginning of experiment. $1{\cdot}9\frac{11}{12}$ lbs.
" " " after one month .. .. .. $3{\cdot}14\frac{5}{12}$ lbs.
" gain in two months of each chicken .... $2{\cdot}4\frac{1}{2}$ lbs.

TABLE IV.—Showing the progress of twelve chickens with a run in a field as compared with the same number kept in a limited run, but fed the same rations. Compare with preceding table.

TABLE IV.—Free Range.

No. of Leg Band on Chicken.	Breed.	Cockerel or Pullet.	Age.		Weight.				Remarks.
			Months.	Days.	Beginning of Experiment.		On 1st September.		
					Lbs.	Oz.	Lbs.	Oz.	Rations.
32	White Plymouth Rocks	C	1	24	1	12	4	0½	Cracked corn and wheat moistened with skimmed milk.
3	" "	P	1	24	1	8	3	0	
14	" "	P	1	24	1	9	3	7	
13	Buff Orpingtons	C	1	20	1	14	4	0½	
26	"	C	1	20	1	5	3	0	
94	"	C	1	20	1	4	2	15	
81	White Wyandottes	C	1	24	2	0	4	0	
39	"	C	1	24	1	10	3	8	
62	"	P	1	24	1	6	2	12	
93	Barred Plymouth Rocks	C	1	24	1	8	3	5	
15	" "	C	1	20	1	5	3	5	
57	" "	C	1	24	1	9	3	15	
	Total weight				18	10	41	4	

Average weight at beginning of experiment.. .. .. 1·8⅝ lb.
" gain in two months, on September 1.. .. .. 1·15 "

FERTILIZATION OF EGGS.

HATCHING RESULTS FROM LARGE AND SMALL GROUPS OF FOWLS.

Many persons entertain the opinion that in order to have strong fertility in eggs only a small number of hens should be mated to one male bird. The following table goes to disprove this. It shows that better results followed the mating of thirty females to one male than with five hens to a single male bird. The eggs were hatched both by hens and by incubators. The fowls in the larger matings were kept in unheated houses and had a run of about 100 square feet each. The eggs marked by an asterisk were hatched by hens, the others in incubators.

TABLE No. V.—SHOWING FERTILITY OF EGGS AND CHICKENS HATCHED (from groups of hens of greater and lesser number and mated to one male bird in each case).

Date Eggs were Set.	Varieties.	1 Male, 5 Females. No. of Eggs Set.	1 Male, 5 Females. Percentage. Fertilization.	Infertility.	Dead during Incubation.	Hatching.	1 Male, 12 Females. No. of Eggs Set.	1 Male, 12 Females. Percentage. Fertilization.	Infertility.	Dead during Incubation.	Hatching.	1 Male, 20 Females. No. of Eggs Set.	1 Male, 20 Females. Percentage. Fertilization.	Infertility.	Dead during Incubation.	Hatching	1 Male, 30 Females. No. of Eggs Set.	1 Male, 30 Females. Percentage. Fertilization.	Infertility.	Dead during Incubation.	Hatching.	Remarks.
1910			%	%	%	%		%	%	%	%		%	%	%	%		%	%	%	%	
April 10	B. Ply. Rock	*43	74½	25½	37¼	37¼	...	...	...	...	...	*17	76½	23½	47	29½	25	88	12	28	60	*Hatched by hens.
" 10	White Leghorn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58	86¼	13¾	24⅛	62⅛	
" 10	" Ply. Rock	...	...	...	...	...	15	92¼	6⅔	45⅔	46⅔	...	...	...	...	...	...	...	...	...	...	
" 10	Buff Orpington	...	...	...	...	...	...	...	...	...	...	*13	92¼	7¾	0	92¼	...	...	...	...	...	*Hatched by hens.
" 25	Black Minorca	...	...	...	...	...	53	66	34	37½	28½	...	...	...	...	...	...	...	...	...	...	
" 25	White Ply. Rock	...	...	...	...	...	74	82½	17⅔	31	51⅓	22	77½	22½	45½	32	...	...	...	...	...	
" 25	" Leghorn	...	...	...	...	...	58	84½	15½	41¼	43¼	*14	92½	7½	7½	85	45	91¼	8¾	20	71¼	*Hatched by hens.
" 25	Buff Orpington	...	...	...	...	...	...	...	...	...	...	54	89	11	18½	70½	...	...	...	...	...	
" 25	White Wyandotte	...	...	...	...	...	...	...	...	...	...	64	69	31	34½	34½	31	90	10	13	77	
" 25	B. Ply. Rock	*30	86⅔	13⅓	23⅓	63⅓	...	...	...	...	...	...	...	...	...	...	131	82	18	18	64	*Hatched by hens.
May 7	Black Minorca	...	...	...	...	...	33	66⅔	33⅓	30⅓	36⅓	...	...	...	...	...	...	...	...	...	...	
" 7	White Ply. Rock	...	...	...	...	...	52	90⅓	9⅔	23	67⅓	...	...	...	...	...	...	...	...	...	...	
" 7	Buff Orpington	...	...	...	...	...	...	...	...	...	...	*18	82¼	27¾	22¼	60	...	...	...	...	...	*Hatched by hens.
" 7	White Wyandotte	...	...	...	...	...	...	...	...	...	...	43	65	35	18½	46½	105	85½	14½	18	67½	
" 7	" Leghorn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40	92½	7½	17½	75	
" 7	B. Ply. Rock	...	...	...	...	...	...	...	...	...	...	*14	92½	7½	14¼	78¼	71	86	14	19½	62½	*Hatched by hens.

It will be noticed from the above table that the highest percentage of fertility was shown by eggs laid by White Leghorns and next Buff Orpingtons. White Wyandotte eggs also showed satisfactory fertility as did the eggs of Barred and White Plymouth Rocks. The largest number of chicks were obtained from 10 Buff Orpington eggs hatched by a hen. The percentage of results was 92¼.

NUMBER OF EGGS LAID DURING THE YEAR BY FIVE TWO-YEAR OLD BARRED PLYMOUTH ROCK HENS.

TABLE VI.—That hens of two years of age—even of the heavier breeds—when properly fed and of a good egg-laying strain, will lay well, particularly during the winter season, is shown by the following table.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August	September.	October.	Total of eggs laid.	Remarks.
	1909.		1910.											
10	.....	....	21	11	19	11	10	12	11	15	13	5	128	
11	.....	10	22	12	18	14	13	15	7	12	8	....	131	
39	.....	....	22	8	14	15	1	11	9	8	13	4	105	
47	.....	12	26	21	21	15	6	1	4	....	18	4	128	
49	.....	2	24	11	17	10	4	20	8	6	7	....	109	
Total	.....	24	115	63	89	65	34	59	39	41	59	13	601	Average 120⅕.

Rations.

Morning.—Mash composed of cut clover, potatoes or turnips all boiled together and rounded up firm with wheat or other ground grain. Fed warm during winter.

Noon.—Grain thrown in the litter on the floor of the scratching sheds. We do this to make the hens search for the grain and so obtain exercise.

Afternoon.—A good feed of grain so as to send the birds to roost with their crops full.

TABLE VII.—SHOWS WHEN THE PULLETS COMMENCED TO LAY.

White Leghorns—November 1, 1910.

Barred Plymouth Rocks—November 2, 1910.

White Wyandottes—November 24, 1910.

White Plymouth Rocks—December 1, 1910.

Buff Orpingtons—December 22, 1910.

Table VIII.—Number of Eggs Laid During the Year.

The following is a list of the number of eggs laid during the different months of the year, dating from April 1, 1910, to March 31, 1911:—

1910—April	2,736
May	3,005
June	2,062
July	1,205
August	507
September	441
October	65
November	241
December	1,003
1911—January	1,330
February	1,433
March	2,861
Total	16,887

STOCK AND EGGS SOLD DURING THE YEAR.

The following number of birds and eggs for breeding and eating purposes were sold during the year, viz.:—

Males for breeding	113
Females for breeding	60
Mixed breeds or culls sold for table use, males	35
Mixed breeds or culls sold for table use, females	48
Number of eggs sold for eating (dozens)	695¼
Number of eggs sold for hatching to March 31, 1911 (settings)	309

ACKNOWLEDGMENT.

I have again to acknowledge the kindness of Dr. C. H. Higgins, Pathologist of the Veterinary Laboratory, Experimental Farm, in making post mortem examinations of fowls which have died during the year. Many cases of diseases of turkeys sent from different parts of the country were also examined and reported upon by him. These reports were first made to Dr. Rutherford, Chief of the Veterinary Department, who courteously forwarded copies of them to our Division.

TABLE IX.—STOCK ON HAND ON MARCH 31, 1911.

Pen No.	Breeds.	Cocks.	Hens.	Cockerels.	Pullets.	Total.	Remarks.
1	White Plymouth Rocks	1	....	....	21	22	Heated House No. 1.
2	White Wyandottes	....	....	1	16	17	" "
3	Buff Orpingtons	....	....	1	18	19	" "
5	Barred Plymouth Rocks	...	....	1	15	16	" "
6	White Leghorns	....	....	1	27	28	" "
21	White Plymouth Rocks	....	13	1	....	14	" " 3.
22	Black Minorcas	1	....	....	7	8	" "
23	White Leghorns	1	10	....	....	11	" "
24	Black Minorcas	....	...	8	1	9	" "
26	White Leghorns	....	22	1	....	23	" "
27	Barred Plymouth Rocks	1	10	....	....	11	" "
29	" "	...	5	1	....	6	" "
32	Buff Orpingtons	....	16	1	....	17	Unheated " 4.
33	White Wyandottes	....	21	1	....	22	" " 5.
34	Barred Plymouth Rocks	....	27	1	....	28	" "
35	" "	1	....	....	24	25	" " 6.
	For breeding and eating purposes	3	....	17	14	35	In different pens in houses No. 2 and 6.
	Capons	2	....	....	....	....	
	Total	10	132	28	142	312	

RESULTS OF EXPERIMENTS WITH EGG PRESERVATIVES.

The following report of experiments in egg preservation conducted by the Dominion Chemist, Mr. Frank T. Shutt, for several years past, has been very kindly handed by him to our Division for publication. Inquiries are constantly being made for informatio on the best method of preserving eggs and authoritative information such as is contained in the following digest, cannot fail to be found timely and valuable:—

THE PRESERVATION OF EGGS.

By Frank T. Shutt, M.A., Dominion Chemist.

For the past thirteen years, experiments in egg-preservation have been carried on by the Division of Chemistry. In the course of this work, which has been reported on from time to time, many fluids and preparations proposed or sold as egg-preservatives have been tried. Our results have shown that the larger number of these utterly fail in their purpose and therefore cannot be recommended. We have further very satisfactory evidence of the efficiency of lime water for this purpose, eggs being frequently kept in this medium for more than a year, quite sound and fit for cooking purposes.

During the past season, we have repeated the trials with lime water and waterglass and also examined into the merits of a new preservative that has appeared on the market under the name of Galo. It is guaranteed that 'fresh eggs dipped in Galo will remain absolutely fresh for a period of twelve months or more, under any ordinary conditions.'

Galo is a fluid with a strongly alkaline reaction. On analysis, it is found to contain silicate of soda, casein held in solution by caustic soda and a small proportion of formaldehyde. The directions for its use are 'the daily production of eggs should be

dipped in Galo after they have been laid and then dried in an ordinary temperature. The non-porous, air-tight and almost invisible film which serves to close the pores of the outer shell, form immediately upon removal from the solution and will dry within fifteen to thirty minutes.'

The trial extended over a period of nine months from July to April, during which examinations were made three times. Saturated lime-water and a 5 per cent solution of water-glass were prepared according to the directions we have issued (and of which a copy can be obtained on application), the eggs treated with Galo were simply immersed in the fluid for one minute, removed and placed in a rack to dry at ordinary temperature. Strictly fresh eggs were, of course, used in these trials. The preserved eggs were kept in a cool, dry, dark cellar.

The first examination was made at the expiration of three months, when the eggs which had been kept in lime-water and silicate of soda were found to be in excellent condition. The 'whites' were not discoloured, the yolks were globular and there was no offensive odour. There were no visible evidences of deterioration.

The eggs treated with Galo were, so far as outside appearance is concerned, quite normal. With respect to the contents, the 'white' had become discoloured to a light reddish-brown, the yolk had become attached to the shell and the whole emitted a distinctly musty odour.

Three months later, -that is, at the end of six months from the date of beginning the experiment, the eggs preserved in lime-water were practically in the same satisfactory condition remarked at the first examination. The eggs in water-glass showed a slight discolouration of the 'whites' and had developed a somewhat stale odour.

Our notes with respect to the Galo preserved eggs at this examination read as follows: outside appearance normal; 'whites' discoloured, of a light reddish-brown tint; yolks, stuck to shell; odour, stale; air space very much enlarged, showing that evaporation had taken place.

The third and last examination, made at the end of nine months, allows us to report as follows:—

Eggs in Lime-water.—In a number of cases, a very slight discolouration of the 'whites' had occurred and the yolks were not so globular as in fresh eggs. There was a slight stale, but not offensive, odour.

Eggs in Water-glass.—Some of the eggs showed marked signs of deterioration, the 'whites' having become highly tinted and somewhat limpid with a distinctly stale odour. In a number of the eggs, the yolks still retained their globular form but in some instances, in spite of the greatest care, the yolk escaped on opening the egg, due to the weakening of its enclosing membrane.

Eggs treated with Galo.—To the eye, the eggs presented no abnormal appearance but their extreme lightness was remarked. On opening them, it was found that evaporation had taken place to such an extent that the air space occupied 50 per cent of the total volume of the egg. The contents, both 'whites' and yolks, were almost solid and firmly adherent to the shell. While there were no visual signs of decomposition, the mass possessed a slightly disagreeable odour. Apart from the objection that might be raised to the drying out of the egg, the contents are not so well preserved as by either of the other fluids under experiment, even at the end of the first three months the 'whites' being markedly discoloured, the yolks degraded and the whole possessing a musty, disagreeable odour.

As regards Lime-water and Water-glass, our results of this season have corroborated those of previous experiments. Both are good egg-preservatives though it is useless to expect either can entirely arrest that 'stale' flavour commonly found in all but strictly fresh-laid eggs. Comparing the two preservatives, we can unhesitatingly say that Lime-water is superior to the Water-glass solution; no preservative has in our hands given such uniformly good results as this simply and cheaply made fluid.

EXPERIMENTAL STATION FOR PRINCE EDWARD ISLAND

J. A. CLARK, B.S.A., SUPERINTENDENT.

CHARLOTTETOWN, P. E. I., March 31, 1911.

Dr. Wm. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Canada.

SIR,—I have the honour to submit herewith the second annual report of the operations on the Experimental Station for Prince Edward Island, at Charlottetown, for the year ending March 31, 1911.

CHARACTER OF SEASON.

The winter of 1909-10 began with heavy snow falls. These continued through January until three feet of snow lay on the level, without any frost being in the ground under it. A great mid-winter thaw removed the snow and allowed all the accumulated water to percolate through the unfrozen soil, which, no doubt, assisted much in making the season of 1910 a record one here for grasses, clovers and cereals.

Spring opened very early. Some ploughing was done on the 12th of April. Sweet peas were sown outside on the 14th. Snow followed this and seeding began about the usual time, May 12.

Three hoar-frosts occurred in May—on the 5th, 6th and 17th. At the Farm, the thermometer registered 33° F. on these dates. The last spring frost occurred June 6. The weather of June and July was showery and well suited to the growing crops. August and the first half of September was exceptionally dry, with moderate temperatures. This gave ideal harvest weather. The first killing frost occurred on October 14.

A snow-fall of one foot on December 16 gave a week of sleighing. This was followed by open weather, wheels being used throughout the country until January 9, when enough snow fell to make good sleighing. February had but one shower of rain and six flurries of snow. The weather of January and February being very cold, the frost entered the ground to a great depth. The first half of March was fine with moderate temperatures. The snow went slowly. The great bulk of the hauling was done during this month.

The hay crop matured slowly and proved to be the heaviest which has been cut in this province in many years. Wheat, oats and barley yielded at least 30 per cent above the average for a number of seasons. The quality was extra good. Both the hay and grain were saved in good condition owing to the harvest weather being most favourable.

Roots, vegetables and corn gave about an average yield, with the exception of potatoes which were rather a poor crop generally and rot was very prevalent among them. The apple crop, which was of fair quality, was much below an average yield.

EXPERIMENTS WITH SPRING WHEAT.

Twelve varieties of spring wheat were sown on May 12 or 13, in uniform test plots of one one-hundredth acre each. The land was a sandy loam on which potatoes had grown the year previous—1909. No manure or fertilizer was applied for this crop after possession of the property was obtained.

The land was well worked though not ploughed in the spring (1910). The seed was obtained from the Central Experimental Farm, with the exception of White Russian and Colorado Bearded, and sown at the rate of about one bushel and three pecks per acre. A mixture of six pounds common red clover, three pounds alsike clover and one pound white Dutch clover was sown per acre.

The land was full of weeds, which required a large amount of attention to keep them under control. The spudding of thistles formed a soil-mulch which was no doubt of value to the growing crop. Neither rust nor lodging occurred on any of the plots.

One variety of Durum wheat (Goose), the seed of which was obtained in Charlottetown, was sown May 13, under the same conditions as the other varieties referred to above.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Weight of Straw.	Strength of Straw on a scale of 10 points.	Kind of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					Lbs.			Lbs.	Bush.	Lbs.	Lbs.
1	Chelsea	Aug.	20	100	5,297	10	Beardless.	2,929	48	49	
2	Huron	"	23	102	5,134	10	Bearded..	2,782	46	22	62·9
3	Marquis	"	22	102	5,068	10	Beardless.	2,756	45	56	62·5
4	Preston	"	21	100	5,206	10	Bearded..	2,725	45	25	63 5
5	Pringle's Champlain	"	23	102	5,378	10	Bearded..	2,516	41	56	61·5
6	Red Fife	"	28	107	6,106	10	Beardless.	2,459	40	59	61·6
7	Bobs	"	22	102	4,453	10	Beardless.	2,406	40	6	63·6
8	Stanley	"	24	103	4,243	10	Beardless.	2,256	37	36	62·1
9	Bishop	"	21	101	4,381	10	Beardless.	2,237	37	17	62·7
10	White Russian	"	24	103	4,543	10	Beardless.	2,031	33	51	59·7
11	White Fife	"	26	105	3,975	10	Beardless.	1,981	33	1	62·4
12	Colorado	"	22	101	4,497	10	Bearded..	1,753	29	13	63·0
	Durum Wheat (Goose)	"	26	105	4,343	9	Bearded..	1,837	30	37	62·1

TEST OF SPRING WHEAT IN ONE-QUARTER ACRE PLOTS.

Six varieties were sown in quarter-acre plots on land similar to that mentioned for the uniform test plots, between May 12 and 20. The only rust observed was on a very small area of the White Russian plot and did but slight injury.

SPRING WHEAT—Test of Varieties in Quarter-Acre Plots.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Straw.	Total Yield.		Yield per Acre.	
						Bus.	Lbs.	Bus.	Lbs.
1	White Russian......	May 14	August 23......	101	Medium..	11	51	44	20
2	Red Fife....	" 14	" 25......	103	Strong...	9	58⅝	39	54½
3	White Fife....... ..	" 14	" 25......	103	"	9	10⅝	36	42½
4	Marquis............	" 12	" 23......	103	"	9	10½	36	42
5	Goose...	" 14	" 26......	104	Weak	8	20	33	20
6	Colorado Bearded....	" 20	" 28......	100	Medium..	7	37	30	28

Average yield per acre: 36 bushels, 54½ lbs.

EXPERIMENTS WITH OATS.

Twenty-one varieties of oats were sown in uniform test plots of one one-hundredth acre each on May 13 at the rate of about two and one-half bushels per acre. The soil was a sandy loam on which potatoes had been grown the previous year. It was not manured nor was any fertilizer applied during the season of 1910. All varieties were strong and stiff in the straw and were not rusted or lodged at harvest time.

The seed was obtained from the Central Experimental Farm, with the exception of Early Blossom, which was registered seed obtained from Mr. Donald Innis, Tobique, N.B. Clover was sown at the rate of: Common Red, 6 lbs.; Alsike, 3 lbs.; White Dutch, 1 lb. on all these plots.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Weight of Straw.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Kind of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Lbs.	In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Abundance...	Aug. 22..	101	7,106	56	10	8	Branching..	4,625	136	1	37·5
2	Irish Victor	" 21..	100	7,112	48	10	8	" ..	4,593	135	3	36·0
3	Garton's "Reg." Abundance........	" 21..	100	6,097	55	10	7	" ..	4,475	131	21	37·0
4	Thousand Dollar.....	" 21..	100	6,150	48	10	7	" ..	4,393	129	7	37·3
5	Wide Awake.	" 22..	101	6,581	42	10	7	" ..	4,368	128	16	36·0
6	Lincoln..	" 24..	103	6,912	51	10	8	" ..	4,300	126	16	35·5
7	Swedish Select.......	" 21..	100	5,900	47	10	6	" ..	4,287	126	3	37 5
8	Improved Ligowo....	" 20..	99	5,678	50	10	8	" ..	4,281	125	31	36·9
9	Banner......	" 22..	101	7,025	41	10	7	" ..	4,275	125	25	35 5
10	Siberian	" 24..	103	7,300	49	10	9	" ..	4,200	123	18	35·0
11	Twentieth Century..	" 20..	99	5,975	46	10	7	" ..	4,200	123	18	37·5
12	Danish Island	" 22..	101	6,925	51	10	7	" ..	4,150	122	2	35·0
13	Gold Rain.	" 19..	98	6,050	45	10	7	" ..	4,106	120	26	37·3
14	Improved American..	" 21..	100	6,350	47	10	8	" ..	4,100	120	20	34·1
15	Pioneer.	" 18..	97	5,472	41	10	8	" ..	4,066	119	20	37·3
16	Early Blossom.	" 26..	105	7,028	53	10	9	Sided.......	4,062	119	16	39·3
17	Golden Beauty.... ..	" 20..	99	5,475	43	10	8	Branching..	4,050	119	4	33·6
18	Victory.	" 25..	104	5,587	47	10	6½	" ..	4,000	117	22	37·8
19	White Giant.........	" 22..	101	6,518	47	10	7	" ..	3,962	116	18	34·3
20	Excelsior.	" 19..	98	6,218	40	10	8	" ..	3,681	108	9	38.0
21	Virginia White......	" 20..	99	3,875	44	10	7	" ..	3,037	89	11	36·1

WHITE OATS.

Four varieties of white oats were sown on a one-acre plot each. The soil conditions under which these grew were very diverse and so lacked uniformity within the named areas, that in the instance of Irish Victor fully one-half of the crop grew upon one-quarter of the acre.

The seed was obtained from seed merchants.

The results were as follows:—

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Total Yield or Per Acre.	
					Bush.	Lbs.
1	Banner...........	May 19.....	August 25..	98	72	6
2	Newmarket	" 20.....	" 26..	98	60	21
3	Ligowo......	" 20	" 24..	96	57	30
4	Irish Victor................	" 20	" 25..	97	39	3

Average yield per acre: 57 bushels, 15 pounds.

BLACK OATS.

Two varieties of black oats were sown in acre plots. This land was too wet to sow earlier than May 31. The soil conditions were quite different from those under which the white oats were grown, but lacked uniformity, as shown by the yields on the three plots of Norway sown at different dates, or under different soil conditions. The seed was obtained from seed merchants.

The results were as follows:—

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Total Yield or Per Acre.	
					Bush.	Lbs.
1	Norway, (No. 3)......	June 1.....	Sept. 15....	106	83	18
2	Norway, (No. 2).............	" 1.....	" 13....	104	64	8
3	Garton's Black Rival....	" 1.....	Aug. 31....	91	55	22
4	Norway, No. 1..............	May 31.....	Sept. 13....	105	42	8

Average yield per acre: 61 bushels, 14 pounds.

EXPERIMENTS WITH BARLEY.

Experiments were conducted in uniform test plots with twenty-one varieties of barley (eleven of six-row and ten of two-row) in plots of one one-hundredth of an acre each. The soil was a sandy loam on which potatoes had been grown the previous year (1909). No manure or fertilizer was used for this crop after possession of the land was obtained.

The land was worked thoroughly with spring-tooth and disc harrows, without using a plough, in the spring of 1910 and sown on May 14 at the rate of two bushels per acre. Clover was sown with these at the rate of: Common Red, 6 lbs.: Alsike, 3 lbs. White Dutch, 1 lb.

There was no rust, but the Hannchen and Swedish Chevalier were slightly lodged.

SIX-ROW BARLEY—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inch's	Lbs.	Bush.	Lbs.	Lbs.
1	Albert.....	Aug. 11	89	41	10	3	3,862	80	35	49·8
2	Claude.........................	" 11	89	40	10	3	3,818	79	26	51·1
3	Mensury.	" 13	91	40	10	2⅓	3,800	79	8	49
4	Nugent	" 13	91	33	10	2⅓	3,387	70	27	49·2
5	Mansfield..................	" 11	89	39	10	2¾	3,168	66	0	50 5
6	Stella..	" 13	91	35	10	2½	3,043	63	19	49·5
7	Odessa..........	" 12	90	36	10	2⅓	2,956	61	28	46
8	O. A. C. No. 21....	" 13	91	36	10	2½	2,887	60	7	49
9	Trooper.....	" 13	91	35	10	2½	2,825	58	41	49·1
10	Yale............................	" 15	93	36	10	2½	2,650	55	10	50·5
11	Oderbruch.................... ...	" 12	90	34	10	2½	2,818	48	33	46

TWO-ROW BARLEY—Test of Va ieties.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inch's	Lbs.	Bush.	Lbs.	Lbs.
1	Invincible	Aug.	18	96	42	9	3	4,000	83	16	50·3
2	Swedish Chevalier	"	19	97	42	9	3½	3,867	80	27	50
3	Hannchen	"	13	91	33	8	2½	3,712	77	16	53·3
4	Standwell	"	13	91	44	10	3	2,862	59	30	51
5	Clifford	"	11	89	59	10	4	2,850	59	18	52·8
6	French Chevalier	"	13	91	36	10	3	2,800	58	16	54
7	Beaver	"	11	89	58	10	4½	2,581	53	37	49
8	Canadian Thorpe	"	12	90	41	10	3	2,475	51	27	51·5
9	Jarvis	"	11	89	52	10	4	2,437	50	37	49·5
10	Danish Chevalier	"	13	91	38	10	3	2,456	49	4	49·8

ACRE PLOTS OF BARLEY.

One acre of Mandscheuri barley (six-row) was grown on heavy, wet land; the previous crop had been oats. It was injured very much by water. The seed was obtained from seed merchants, was sown on June 6, and gave a yield of 35 bushels per acre.

One acre of Duck-bill barley (two-rowed) was grown on a heavy, wet soil which flooded after the barley was up and drowned out quite a considerable area. The seed was sown on June 6, and yielded 20 bushels of a poor quality of grain.

EXPERIMENTS WITH PEAS.

Thirteen varieties of peas were grown under uniform conditions on plots of one one-hundredth of an acre each. The land was a sandy loam which had been in potatoes the previous year. The soil was worked to a fine condition of tilth and sown on May 13, at the rate of about two bushels per acre. At the same time it was sown with Common Red clover 6 lbs., Alsike 3 lbs., White Dutch 1 lb. per acre.

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening.		Number of Days Maturing.	Weight of Straw.	Average Length of pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
						Lbs.	In.	Lbs.	Bush.	Lbs.	Lbs.
1	Arthur	Medium	Aug.	27	106	4,019	2¼	2,656	44	16	65.3
2	Prince	Large	Sept.	1	111	5,200	2½	2,575	42	55	
3	Picton	Medium	Aug.	31	110	4,332	2½	2,500	41	40	64
4	Prussian Blue	"	"	29	108	4,444	2¼	2,425	40	25	64·3
5	Paragon	"	Sept.	2	112	5,250	2⅓	2,344	39	4	65
6	English Grey	"	"	3	113	5,900	2½	2,319	38	39	62·5
7	Daniel O'Rourke	Small	"	2	112	5,200	2¼	2,219	36	59	63
8	Black-eye Marrowfat	Large	"	3	113	*6,950	2½	2,212	36	52	63·7
9	Chancellor	Small	"	1	111	4,819	2	2,156	35	56	65
10	Mackay	Medium	"	2	112	5,450	2½	2,100	35	..	64
11	White Marrowfat	Large	"	1	111	5,138	2½	2,062	34	22	64
12	Golden Vine	Small	"	3	113	5,382	2	1,925	32	5	65
13	Gregory	Medium	"	6	118	*7,000	2¼	1,639	27	19	63·5

* Straw green when weighed.

BUCKWHEAT.

One acre of Silverhull buckwheat was grown as a cover crop to check the fall growth of the apple trees in the orchard.

Rather poor sod-land was broken in the autumn of 1909. Ten tons per acre of barn-yard manure was applied as a dressing to this in the spring of 1910. The sod was thoroughly worked up during the month of June and the Couch grass worked out of it. It was sown on July 12, and harvested the 30th day of September.

The straw was still green and did not thresh out as clean as it should. Thirty-three and one-half bushels recleaned seed was obtained from the acre.

EXPERIMENTS WITH INDIAN CORN.

Eleven varieties of Indian corn were grown for ensilage. The soil was uneven and unsuitable for uniform test plots, but was the best available for the season, 1910. The land had been in potatoes the previous year—that is, parts of it were; the remainder in stone piles, newly-cleared land and a roadway.

Nine of these varieties were grown in rows thirty-six inches apart. The plants were thinned to about six inches apart in the rows. Four of the above-mentioned sorts and two promising early varieties were also grown in hills thirty-six inches apart each way. The land was top-dressed with barn-yard manure at the rate of fifteen tons per acre. This was well worked in with disc harrows, and the seed sown on June 9.

The yields of each variety from rows and hills were calculated from two inside rows each sixty-six feet long, the outside rows being discarded.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

Number.	Name of Variety.	Date of Cutting.	Average height.	Condition when Cut.	Weight per Acre Grown in Rows.		Weight per Acre Grown in Hills.	
			In.		Tons.	Lbs.	Tons.	Lbs.
1	Compton's Early	Oct. 3	100	Tasselled	30	60	18	1,510
2	Wood's Northern Dent	" 3	98	"	27	1,310		
3	Longfellow	" 3	104	"	27	780	20	150
4	Eureka	" 3	96	In silk	25	1,150		
5	Early Mastodon	" 3	91	Early milk	24	1,940	22	1,650
6	Selected Leaming	" 3	90	Tasselled	24	1,280		
7	Angel of Midnight	" 3	72	Late milk	23	1,300		
8	White Cap Yellow Dent	" 3	90	Tasselled	21	1 780	17	1,310
9	Superior Fodder	" 3	108	In silk	15	1,312		
10	North Dakota White	" 3	82	Tasselled	......	...	15	140
11	Davidson's Quebec Yellow	" 3	67	Glazed, ripe	.....	......	8	1,150

MIXED GRAINS.

On small, triangular corners of ground, mixed grains were grown. These made very rank growth and lodged. They were, in most cases, cut and fed green. The seed was mixed equal parts by weight of oats, barley and peas, and was sown at the rate of three bushels per acre. A record was kept of one-half acre which yielded 1,513 pounds mixed grain, or at the rate of 75 bushels and 26 pounds per acre, allowing 40 pounds per bushel.

EXPERIMENTS WITH TURNIPS (SWEDES).

FIRST SOWING.

Ten varieties of Swede turnips were tested on fallowed sandy loam, which was manured at the rate of twenty tons per acre early in the spring and thoroughly worked into the soil. The seed was sown in drills two and one-half feet apart and the young plants were thinned out to about twelve inches apart in the rows. This seed was sown on May 27, and the roots pulled on November 7.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Pulling.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.	
				Tons.	Lbs.	Bush.	Lbs.
1	Hartley's Bronze	May 27	Nov. 8	32	1,604	1,093	24
2	Good Luck	" 27	" 8	30	60	1,001	..
3	Perfection Swede	" 27	" 8	28	232	937	12
4	Hall's Westbury	" 27	" 8	25	1,744	862	24
5	Halewood's Bronze Top	" 27	" 8	25	1,612	860	12
6	Mammoth Clyde	" 27	" 8	25	556	842	36
7	Magnum Bonum	" 27	" 8	25	292	838	12
8	Jumbo	" 37	" 8	24	708	811	48
9	Carter's Elephant	" 27	" 8	24	312	805	12
10	Bangholm Selected	" 27	" 8	23	68	767	48

CLUB-ROOT OF TURNIPS.

Second Sowing of Swedes.

Eleven varieties of Swede turnips were sown June 8 on land which had been in potatoes the previous year. Some improved Island-grown seed was obtained and sown with the other ten varieties mentioned.

The soil proved to be infected with the 'Fingers and Toes' disease, known as 'Club-root of Turnip.'

A row 200 feet long, in which there should have been 200 turnip plants, of each variety, was measured and on November 9 a count was taken of the actual number of turnips which had survived, the number which were affected but still growing, and the number of sound turnips which had resisted the disease. A number of the sound specimens of each variety were selected and labelled. They will be kept and seed grown from them during 1911.

The following are the results obtained:—

Number.	Name of Variety.	Turnips Living, Nov. 9.	Number Sound Turnips, Nov. 9.	Number of Rotten Turnips still Living, Nov. 9.	Per cent of sound Turnips out of possible 200.	Per cent Diseased.
1	Bangholm Selected	71	13	58	6·5	93·5
2	Carter's Elephant	48	3	45	1·5	98·5
3	Good Luck	93	53	40	26·5	73·5
4	Halewood's Bronze Top	41	23	18	11·5	88·5
5	Hall's Westbury	6	....	6	....	100·
6	Hartley's Bronze	60	22	38	11·	89·
7	Jumbo	36	....	36	....	100·
8	Magnum Bonum	147	90	57	45·	55·
9	Mammoth Clyde	68	6	62	3·	97·
10	Perfection Swede	59	3	56	1·5	98·5
11	Island Seed	64	2	62	1·	99·

EXPERIMENTS WITH MANGELS.

Eight varieties of mangels were sown on May 28 on a fallowed sandy loam, prepared in the same way as the turnip ground. The seed was sown in drills thirty inches apart and the young plants thinned to about twelve inches in the rows. Yields were computed from the product of two rows, each sixty-six feet long. The roots were pulled October 15.

MANGELS.—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.	
		Tons.	Lbs.	Bush.	Lbs.
1	Yellow Intermediate	33	1,930	1,132	10
2	Selected Yellow Globe	33	1,518	1,125	18
3	Half Sugar White	30	1,809	1,030	9
4	Giant Yellow Globe	30	1,256	1,020	56
5	Gate Post	29	138	968	58
6	Giant Yellow Intermediate	28	150	935	50
7	Prize Mammoth Long Red	26	1,287	888	7
8	Perfection Mammoth Long Red	26	816	880	16

FIELD CARROTS.

Five varieties were tested on fallowed sandy loam, manured and prepared the same as for the other roots. The yield was computed in the same way. Two sowings were made, the first on May 28 and the second on June 8, and the roots were pulled on October 15.

CARROTS—Test of Varieties.

Number.	Name of Variety.	1st Sowing. — Yield per Acre.		1st Sowing. — Yield per Acre.		2nd Sowing. — Yield per Acre.		2nd Sowing. — Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	15	168	502	48	9	314	305	14
2	White Belgian.......	11	308	371	48	8	1,820	297	..
3	Ontario Champion	9	1,140	319	..	9	876	314	36
4	Improved Short White	7	1,540	259	..	7	1,312	221	52
5	Half Long Chantenay.........	6	954	215	54	6	1,050	217	30

SUGAR BEETS.

Three varieties of sugar beets were sown on fallowed sandy loam, manured and prepared in the same way as for the other roots. The yields were computed in the same way. They were grown to ascertain their sugar-content, which, from the analysis made by Mr. Frank Shutt, Dominion Chemist, was low. The roots were pulled on October 15.

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Average weight of one Root.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		Lbs.	Oz.	Tons.	Lbs.	Bush.	Lbs.	%	%	%
1	French Very Rich....	2	6	18	1,372	622	52	14·26	17·26	82·6
2	Klein Wanzleben.....	1	9	14	1,832	497	12	13·96	16·83	82·9
3	Vilmorin's Improved..	2	14	14	809	480	9	14·54	17·88	81·3

POTATOES.

The yield of the potato crop in 1910 was much below the average. The plants did not recover from the long drought of August and the first half of September. A large percentage of rot was reported throughout the province.

The seed was cut into sets with one or two eyes in each. These sets were soaked for one hour in a solution of one pint formalin to thirty gallons water, dried and planted in rows thirty inches apart, the sets being placed about one foot apart in the row. The plants were sprayed every ten days throughout the growing season with Bordeaux solution containing Paris green.

The land was a sandy loam, fallowed, manured and prepared as for the other roots. The yield per acre was computed from the weight of two rows, each sixty-six feet long. The potato sets were planted on May 26 and were dug on October 7.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Burbanks' Seedling	328	54	324	30	4	24	277	12	47	18	Long white.
2	American Wonder	319	..	310	12	8	48	259	36	50	36	" "
3	Everett	307	27	304	9	3	18	204	36	99	33	Oval "
4	Empire State	306	54	302	30	4	24	278	18	24	12	Long "
5	McIntyre	302	30	302	30	..	..	256	18	46	12	" blue.
6	Late Puritan	299	12	294	48	4	24	260	42	34	6	" white.
7	Morgan Seedling	294	48	292	36	2	12	245	18	47	18	" "
8	Irish Cobbler	275	..	267	18	7	42	218	54	48	24	Round "
9	Vick's Extra Early	243	6	243	6	..	..	226	36	16	30	Long "
10	Bliss Triumph	241	27	239	48	1	39	204	36	35	12	Round pink.
11	Money Maker	223	51	218	21	5	30	163	54	54	27	" white.
12	Reeves' Rose	217	15	215	36	2	12	162	48	52	48	Long pink.
13	Ashleaf Kidney	217	48	215	36	2	12	158	24	57	12	Round white
14	Carman No. 1	196	54	193	36	3	18	112	12	81	24	" "
15	Gold Coin	189	12	188	6	1	6	143	..	45	6	" "
16	Rochester Rose	168	18	168	18	..	..	144	6	24	12	Long pink.
17	Dreer's Standard	143	..	140	48	2	12	58	18	82	30	Round white
18	Dalmeny Beauty	114	24	112	12	2	12	79	12	33	..	Oval "
19	Hard to Beat	107	48	107	48	..	..	77	..	30	48	Round "
20	Factor	94	36	92	24	2	12	61	36	30	48	Long "

TIMOTHY.

Nine acres of timothy were grown. The results were as follows:—

Field.	Size in Acres.		Total Yield.		Yield per Acre.	
	Acres.	Chains.	Tons.	Lbs.	Tons.	Lbs.
Gay	2	2	7	1,530	3	1,055
Chandler	7	1·43	13	463	2	633

ALFALFA.

Alfalfa seed was sown on four quarter-acre plots on May 21. A sandy loam soil was broken during the summer of 1909 and worked during the late autumn. It was given a dressing of barn-yard manure at the rate of ten tons per acre. The ground was thoroughly worked in the spring and inoculated by distributing soil from a patch in the orchard where alfalfa had been growing three years. Eight barrels of slaked lime were spread on the acre and worked into the soil.

Plot 1 was sown at the rate of 16 lbs. alfalfa per acre without nurse crop. Two cuttings were made which were allowed to lie on the ground during the summer. This plot was in fair condition in the autumn and seems, at this date (March 31), to have wintered well. Plot No. 2 was sown with wheat at the rate of one bushel per acre as nurse crop with the same quantity of alfalfa seed as No. 1. The wheat made a strong growth, yielding at the rate of 8 bushels and 44 pounds per acre and choked out the alfalfa very much.

Plot No. 3 was sown with barley at the same rate as the wheat and at the rate of 16 pounds per acre of alfalfa seed. This plot looked much better than No. 2 but was also very unsatisfactory.

Plot No. 4 was sown with oats at the rate of one bushel per acre and with the same quantity of alfalfa seed as the others. The alfalfa on this plot was not so good as on No. 3.

On July 21, the Pear Orchard was sown with Alfalfa seed at the rate of 20 pounds per acre. This made a very rapid growth and on September 30 there was an even stand, averaging twenty-three inches in height.

ADDITION TO FARM.

Possession was taken of the small triangular portion of the 'Ravenwood' property which lies on the west side of the railway, and a crossing was put in over the railway. The area taken over was 1·55 acres making a total area now in the Charlottetown Experimental Station of 59 acres.

FENCES.

New fences were erected along the boundaries adjoining the Mount Edward road, the De Blois road and the Beer property and also along one-half of the property adjoining that owned by Judge R. R. Fitzgerald. A new fence was also erected around the entire boundary of the portion of the 'Ravenwood' property which lies west of the railroad.

BUILDINGS.

One of the buildings was moved back from near the Superintendent's residence, repaired and made into a convenient carriage house and work-shop. A temporary threshing-floor was laid in another building, on which all the threshing was done. A stable was fitted up in the largest barn which has accommodated the horses for the year. A new machine-house, 80 feet by 25 feet was built and a floor laid in the loft which has been used for a granary and sample room. Most of the material required for a new barn, 60 by 40 feet, has been bought, and stored in the machine-house.

TILE DRAINAGE.

Tile drains were laid thirty feet apart through the areas of swamp land which lie on either side of the St. Avard's road. These discharge into drainage wells. It was necessary to drill three wells beside the one mentioned in last year's report. The underlying strata of sandstone rock apparently have many fissures in them. One of these wells, sixty-five feet deep, was tested and it was found to be carrying off over 7,000 gallons per day. A drainage system consisting of a six-inch main drain, four-inch sub-mains and three-inch laterals (the latter being 33 feet apart) was laid from the Blake property across the Johnson property and one-half way along the railway front of the 'Ravenwood' property to an outlet where it discharges into the railroad ditch. A system for the higher wet areas on the Blake property was started at the boundary with the Johnson property. The main drain for this system passes through the bottom of the old Pottery pond to the De Blois road, follows parallel with this road until it discharges into the gutter at a point about 200 feet east of the railway ditch.

The springy condition of the soil made the work more difficult and expensive than it would otherwise have been, owing to a very wet season, which set in before the tile was all laid. In these systems, 15,000 feet of tile have been laid and considerably more will yet be required for the higher wet areas in the Blake property.

GENERAL WORK.

The land cleared the previous fall near the Superintendent's residence was levelled, graded and seeded down to lawns. A number of rows of trees, together with cross fences and dykes were removed from the farm and the land prepared for cultivation. Three cellars, where former buildings stood, have been filled and the uneven ground adjoining has been graded. A small pond has also been filled. This land will be ready for cultivation in the spring of 1911. The old Pottery pond, which was drained as before mentioned, has been partly filled. This work will be finished as soon as opportunity offers.

The site for the proposed barn was excavated and a part of the bridge approaches constructed. About 215 tons of manure have been hauled from the city.

HORSES.

A team of draft horses, aged four and seven years, was purchased. The draft mare purchased last year has raised a good colt. There are now on the Farm three draft horses, one draft colt eleven months old, and a driver. All are in a thrifty condition.

ORCHARDS.

An orchard containing about fifty apple trees, twenty of which are quite old, was on the 'Ravenwood' property. This had been neglected for some time. A number of the broken and decayed trees were removed and the sod was broken from around those remaining. Among the old trees are a few Ribston Pippins which gave about one-half a crop in 1909. The younger part of this orchard is not yet in bearing but appears to be largely Pewaukee trees.

Stock for new orchards was received from the Central Experimental Farm, Ottawa, and E. D. Smith, Winona, Ontario. The trees arrived in good condition and were planted early in May. The site chosen has a southerly slope, and a shelter belt of forest trees on the north and east. The soil, which is a sandy loam, has good natural drainage; it was very weedy and in a run-out condition. This old sod was ploughed down in the summer of 1910. A dressing of ten tons of barn-yard manure per acre was applied and worked in during the spring of 1910. During the early summer, the ground was continually cultivated, the couch worked out, and the other weeds killed. On July 21, cover crops were sown of buckwheat and of several mixtures of grain. The whole was seeded down to clover at the rate of ten pounds per acre.

APPLES.

The new orchard of one hundred and sixty apple trees, in which seventy varieties are represented, was planted on the west side of the field which lies between the St. Avard's road and the Superintendent's residence. These trees have all made a strong, thrifty growth. They were set thirty feet apart each way.

CHERRIES.

A cherry orchard of forty-two trees was planted adjoining the east side of the apple orchard. The trees were set twenty feet apart each way. Sixteen varieties are represented. With the exception of one dead tree (Windsor), these are strong and thrifty.

PLUMS.

A plum orchard of ninety-eight trees, representing seventy-eight different varieties was planted just east of the cherry orchard. These trees made a very vigorous growth and look promising at the present time. Two trees—'Mankato' and 'Consul'—died back but are growing from the root. One 'Cottrell' tree is dead.

PEARS.

The pear orchard was placed between the Superintendent's residence and the Mount Edward road. It lies next to the lawn which contains the beds of perennial flowers. Forty-six trees were planted representing eighteen varieties. These are all healthy and have made a very strong growth.

SMALL FRUITS.

GRAPES.

A vineyard of sixteen varieties of early hardy grapes, containing ninety-six grape vines, was planted to the east of the pear orchard. The vines were planted eight feet apart each way and made a vigorous growth, three varieties maturing fruit.

CURRANTS.

The currant plantation wintered well, made a vigorous growth, a number of the varieties maturing a small amount of fruit of good quality.

RASPBERRIES.

A plantation of raspberries was set just south of the currants in rows fifty-one feet long and six feet apart. The canes were set three feet apart in the rows. This plantation contains nine varieties of black-cap, four or red and one of white raspberries. There are fifty-one bushes of each variety. The growth of 1910 was very strong, many of the black-caps making a growth of nine feet. Several varieties matured a small amount of excellent fruit.

GOOSEBERRIES.

A plantation of ten varieties of gooseberries of six bushes each was planted in rows six feet apart. The bushes were spaced four feet apart in the rows. This plantation adjoins the black raspberries and was put on the heaviest soil on the Farm. A few bushes died, while the rest made medium growth.

BLACKBERRIES.

Ninety blackberry canes were placed in a plantation representing three varieties. These were planted south of the gooseberries in rows eight feet apart, the bushes being four feet apart in the rows and made a very strong growth. No fruit was matured.

DEWBERRY (LUCRETIA).

Sixty Lucretia dewberry plants were set in rows six feet apart, the plants being five feet apart in the rows, to the south of the raspberries.

STRAWBERRIES.

Twenty varieties of twenty-five plants each were received from Ottawa. These and one variety obtained at Charlottetown were planted, just east of the grape vineyard, in rows three feet six inches apart. The plants were set eighteen inches apart in the rows. The soil was badly infested with a small worm which destroyed a great many of the plants received from Ottawa. The variety Glen Mary had all been killed within a fortnight after being set. The plants obtained here seemed to withstand the ravages of this worm.

TREES AND SHRUBS.

A collection of 1,259 trees and shrubs was received from the Central Experimental Farm, Ottawa, to be used for ornamental purposes. These were immediately placed in nursery rows. Early in May, the greater portion of them were planted, under the direction of Dr. Wm. Saunders, about the residence, along the driveway and in two rows parallel with the railway alnog the front of the Farm. These rows are ten feet apart and the trees are ten feet apart in the rows. With the exception of one shipment (largely conifers) which was delayed in transit and very badly dried out, the trees are thrifty, and have grown well. The season is not far enough advanced yet to determine how many are winter-killed, and for this reason the list is omitted.

VEGETABLES.

The season was favourable and vegetables grew abundantly. They were protected from the frost of June 6, and suffered very little injury from insects or diseases. Complete notes on the various vegetables grown in the garden will not be attempted. A few items of particular interest will probably be sufficient. The varieties tested in each instance are named in order of merit.

Asparagus.—Two hundred asparagus roots, obtained from Steel, Briggs & Co., Toronto, were planted in a bed of rich loam which was well worked and manured. These plants grew very strongly and were covered with barnyard manure as a protection for the winter.

Beans.—Planted May 28. All the varieties ripened.
Dwarf Extra Early Edible Podded.
Dwarf Matchless.
Emperor of Russia.
Fame of Vitry.
Dwarf Wax Every Day.

Beets.—Sown May 20. Fit for table in July.
Extra Early Egyptian.
Early Blood-red Turnip.
Egyptian Flat Early Extra.
Nutting's Dwarf Red.

Brocoli.—Sown May 20. Did not mature.
Extra Early White.

Brussels Sprouts.—Sown May 20. Used November 1.
Dwarf Improved. Quality excellent.

Cabbage.—Sown April 20 in hotbed. Planted in open May 24.

Large Late Flat Dutch. Extra Early Savoy.
Early Jersey Wakefield. Fottler's Improved Brunswick.

Carrots.—Sown May 20.

Early French Horn. Amsterdam Scarlet.

Cauliflower.—Sown April 20. Transplanted May 24. Produced fine, uniform heads.

Earliest Erfurt. Early Snowball.

Corn (table).—Planted May 24. Large yield of good quality. First used as follows:—

Malakoff, August 26. Golden Bantam, September 2.
Pocahontas, September 16.

Cucumber.—Sown May 21. Light yield.

White Spine.

Lettuce.—Sown April 20. Used May 20. Three later sowings.

Wheeler's Tom Thumb. Cos Trianon.
White Wonder. Red-Edged Victoria.
Unrivalled Summer.

Onion.—Sown May 20. Injured by maggots.

Large Red Wethersfield. Danver's Yellow Globe.
Paris Silverskin.

Peas.—Planted May 30. Very prolific.

American Wonder.

Radishes.—Sown April 20. Four later sowings. Ready for use as follows:—

Forcing Turnip Scarlet, May 20. Black Spanish (Winter Radish)
Early Scarlet White Tipped, May 26.

Squash.—Sown April 20. Transplanted May 31. Abundant yield.

Hubbard. Long White Bush Marrow.
Custard Marrow. Vegetable Marrow, yellow.
Mammoth Whale.

Tomatoes.—Sown April 20. Transplanted May 30.

Spark's Earliana. A very heavy yielder of beautiful, smooth fruit.

Turnip.—

Early White Strapleaved.
Extra Early Colnt.

THE FLOWER GARDEN.

The flower garden was very satisfactory. The beds were prepared on ground which had been cleared from heavy trees the previous autumn. After grading and levelling, a number of beds were laid out, intervening spaces being re-seeded to lawn. Both annuals and perennials gave an abundance of bloom, the sweet peas and roses attracting the admiration of all visitors to the Farm throughout the season, their bloom lasting well into November.

ANNUALS—Sown April 20 in hotbeds. Set out May 21.

Varieties.	In Bloom.	
	Season.	Quality.
Asters	Early	Excellent.
Balsam	Late	"
Nasturtium, 4 varieties	Early	"
Stocks	Late	Medium.
Zinnia	"	Excellent.

ANNUALS—Sown May 21 in the open

Varieties.	Quality.
Abronia	Fair.
Brachycome	Poor.
Celosia, two varieties	Fair.
Chrysanthemums, two varieties	Excellent.
Coreoposis	Poor.
Candytuft	Excellent.
Calendula	Poor.
Eschscholtzia, two varieties	Very fine.
Gaillardia	Poor.
Helichrysum	Good.
Kochia	Excellent.
Lobelia	Fair.
Lagitoa	Poor.
Mignonette	Very fine.
Nemesia	Fair.
Phlox (2)	"
Poppy (6)	Good.
Pansy, Psyche	Fair.
Salpiglossis	Good.
Scabiosa (2)	Poor.
Sweet peas (24)	Excellent.

PERENNIALS—Planted in 1910.

The following perennials were received from the Central Experimental Farm, Ottawa, and set out early in May.

Asters—

Novi Belgii Candida,
Decorus Elegantissima,
Alpinus Superbus,
Margaret,
Maacii (2),
Newry Seedling, (2).
Spectabilis,
Amelloides,
Laevis Arcturus,
Trinervis,
Nova Angliae Roseus,
Decorus,
White Queen,
Novi Belgii Robt. Parker,
Laevis Harvardi,
Amelus Amelloides,
Novæ Angliæ Praecox,
Spectabilis Major,
Novae Angliae Var,
Amethystinus,
Mrs. J. F. Raynor,
Paniculatus,
Top Sawyer (2),
Acris,
Discolor,
Wm. Bowman.

CANNAS.

Among the Cannas, the 'Wm. Saunders' was the only one which gave a vigorous growth and abundant bloom. The list is as follows:—

Wyoming,
Pennsylvania,
Louisiania,
Indiana,
H. Wendland,
Allemania,
Jupiter,
Mrs. Geo. A. Strohlein,
William Saunders,
Queen Charlotte,
Miss B. Brunner,
America,
J. D. Eisele,
Paul Lorenz,

DAHLIAS.

Many of the Dahlias rotted in the hotbed, but any that were set out gave abundant bloom throughout the summer and up to the latter part of October. Those received were as follows:—

Bon Ton,
Cuban Giant,
A. D. Livoni,
Louis Harlot,
Earl of Pembroke,
Flossie,
Evadne,
Gloriosa,
Austin Cannell,
Standard Bearer,
Capstan,
Pendant,
Eureka,
Kingfisher,
Cyde,
Empress of India,
Blue Oban,
Island Queen,
Miss Finch,
Miss Anne Jones,
Lady H. Grosvenor,
Kyneryth,

GLADIOLI.

The Gladioli, though planted late, came on rapidly and made a splendid showing throughout the summer. The list was as follows:—

42 Gladioli mixed,
3 " new yellow,
3 " La Luna,
2 " Peacock Eye,
2 " Peau,
2 Gladioli Blue Jay,
2 " Dazzler,—18
1 " Dazzler,—19,
1 " Blackeye Beauty.

IRISES.

The rectangular bed nearest the residence and between it and the Mount Edward road was planted with Irises, which gave beautiful bloom early in the season. The following bulbs are strong and vigorous:—

Neglecta Sappho,
" Agathe,
" Salvatori,
Variegata Coquette,
" Honorabile,
" Ossian,
" Gracchus,
" Ganymede,
" Darius,
Jacquesiana (2),
Pallida (2),
Pallida lilacina,
Sambucina Solomon,
Amœna Julie Grise,
" Mrs. H. Darwin,
Pallida Chameleon,
Squalens Cerberus,
Amoena Duc de Nemours,
" Verschuur,
" Calypso,
Plicata Gisele,
" Madame Chereau,
" Lord Seymour,
Squalens Reine des Belges,
Florentina,
Orientalis (2),
Pumila,
Squalens Lady Seymour,
Monnieri,
Aurea,
Squalens,
Variegata Gracilis,
Assueris,
Variegata,
Neglecta Ariadne

View of Superintendent's House and part of Vegetable Garden.

6—p. 312.

PÆONIES.

Two rows of pæonies were placed in a rectangular bed parallel and six feet east of the Irises. These gave a very rich bloom during the month of June. The varieties are as follows:—

Gloire de Chas. Gombault,
Osman, Mechin,
Clarissa Calot,
Festiva Maxima,
Marie Lemoine,
Jules Elie,
Jeanne d'Arc,
Mme. Loise Mere,
Mr. Dupont,
Felix Crousse,
Mme. de Galhau,
Rosea Grandiflora,
Edouard Andre,
Atrosanguinea,
Illustration,
Triomphe de l'Exposition,
Bernard Palissy,
Victoire Modeste,
Potzii,
Lady Dartmouth,
Buyckii,
Comte de Neipperg,
Marshal Vaillant,
Lutea Plenissima,
Mme. Mechin,
Insignis,
Mme. Raguet,
Magnifica,
Mme. Chaumy,
Adolph Rosseau,
Baron de Rothschild,
Reine de France,
Dr. Brettoneau,
Mlle. Guerin,
François,
Duchess de Orléans,
Noemie,

ROSES.

Two parallel rows of rose bushes were set in a rectangular space six feet east of the pæonies. These attracted much attention by their beautiful bloom which continued throughout the summer and late in the autumn. The varieties planted are as follows:—

2 Baroness Rothschild,
2 Captain Hayward,
2 Charles Lefebvre,
2 Killarney,
2 Earl of Dufferin,
2 Fisher Holmes.
4 Frau Carl Druschki,
2 General Jacqueminot,
2 John Hopper,
2 LaFrance,
4 Madame Gabriel Luizet,
2 Magna Charta,
4 Margaret Dickson,
2 Merveille de Lyon,
4 Mrs. John Laing,
2 Mrs. R. G. Sharman Crawford,
2 Paul Neyron,
2 Ulrich Brunner,
2 Persian Yellow,
2 Crimson Rambler,
2 Dorothy Perkins.

MISCELLANEOUS PERENNIALS.

The following list of miscellaneous perennials were placed in a large rectangular bed containing three rows, with the asters and dahlias:—

Dahlias:—
Monarda Didyma carminata,
Epimedium sulfureum,
Helianthus Daniel Dewar,
Funkia Sieboldiana,
Sempervivum Corni di Canzo,
Aconitum uncinatum,
Vinca herbacea fl. pl.
Acorus Japonicus,
Spiraea ulmaria, fol, var.
Epimedium colchicum,
Geranium sylvaticum,
Doronicum plantagineum,
Spiraea,
Lady's Grass,
Heliopsis Pulcherrima,
Chrysanthemum lacustre,
Phlox Eclaireur,
" Helene Vacaresco,
Sempervivum tenellum,
François de Neufchateau,
Rudbeckia laciniata,
Boltonia latisquama,
Centaurea montana.
Lady Florence Hastings,
Thermopsis Caroliniana,
Delphinium,
Dracocephalum virginicumalbum,
Hilianthus rigidus,
Spiraea venusta,
Inula macrocephala,
Tradescantia virginica,
Doronicum davuricum,
Vinca minor var,
Spiraea,
Phlox l'Aiglon,
" Daniel Lesueur,
" Gen. Grovaninilli,
Acorus spurius,
Rudbeckia (Golden Glow),

AGRICULTURAL MEETINGS.

During the year a number of addresses were given at Farmers' Institute meetings, whenever these could be arranged so as not to interfere with farm work.

EXHIBITIONS AND SEED FAIRS.

I have attended the following exhibitions: The Dominion Exhibition at St. John, N.B., September 3 to 12; the Provincial Exhibition held at Charlottetown, P.E.I., September 19 to 23, and the Maritime Winter Fair and Live Stock Show at Amherst, Nova Scotia, December 5 to 9. At the Prince County Exhibition held at Summerside, P.E.I., September 15 to 17, and at the Institute Exhibition at Tracadie, Prince Edward Island, November 3, I gave addresses and acted as judge of small seeds and vegetables.

SEED FAIRS.

I attended the Seed Fair held at Georgetown, P.E.I., March 3, the Provincial Seed Fair at Summerside, March 8 to 10, and the Central Seed Fair at Charlottetown, March 14 to 17, giving addresses on 'Field Crops' and acting as one of the judges. I also attended the Canadian Seed Growers' Association held in Ottawa, February 16 and 17.

TRURO SHORT COURSE.

I gave assistance and instruction during the short course at the Truro Agricultural College from January 3 to 13.

CORRESPONDENCE.

During the year 532 letters were received and 500 sent out, not including circulars.

VISITORS.

While a great many visitors and a number of school classes visited the Farm during the summer months the farmers of the province have not yet come in large numbers. It is hoped that excursions may be arranged for during the coming summer.

METEOROLOGICAL RECORDS.

Months.	Temperature—F.					Rainfall.		Snowfall.		Total Precipitation.	Bright Sunshine.
	Maximum.		Minimum.		Monthly, Mean.						
1910.	Date.	°	Date.	°	°	Days.	In.	Days.	In.	In.	Hrs.
April	25	64	29	23	42·5	10	2·63	7	6·5	3·28	163
May	27	71	5–7	33	49·5	13	2·38	......	......	2·38	193
June	22	76	6	34	56	15	4·69	......	......	4·69	211
July	10	84·5	3	50	66·6	15	3·14	......	.. ..	3·14	288
August	14	80	31	41·5	64·3	10	1·09	......	......	1·09	257
September	13	72	30	40	57·5	11	2·84	......	......	2·84	192·6
October	6–7	69	14	29	46·7	17	6·78	......	......	6·78	80·7
November	5	56·5	22	22	37·88	17	4·44	4	4·5	4·89	59·3
December	2–30	46	19	–0·5	23·92	6	1·38	10	25·2	3·9	59
1911.											
January	4	49·5	18	–15	18·16	9	2·06	5	17·5	3·81	98·5
February	5–27	40	13	–9	13·07	1	0·42	6	4·5	1·17	135·6
March	28–30	48	5–7	–7	22·99	6	0·65	7	14·2	2·07	158·7
Total Annual	.....	...	......	......	....	130	32·50	39	72·4	40·04	1,896·4

I have the honour to be, sir,

Your obedient servant,

J. A. CLARK,

Superintendent.

EXPERIMENTAL FARM FOR NOVA SCOTIA.

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., March 31, 1911.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of the operations on the Experimental Farm for Nova Scotia at Nappan, N.S., for the year ending March 31, 1911.

The summer season of 1910 was the most favourable for the growing of hay and grass crops that the province has experienced for some years, as the growing period opened earlier than is customary with an unusual amount of rain until well into May, fair weather following this for some time.

Seeding operations began somewhat earlier than the previous year, May 10, but from May 24, practically all through June, the weather was so broken and wet that the sowing progressed quite slowly, with the result that it was finished quite as late as usual, *i.e.*, about the end of June, some turnips being sown as late as July 3.

All crops made very good growth until about the middle of July. From this out, all through the month of August, the weather was colder than usual, with little rain.

Grain and root crops, particularly root crops, that seemed to offer exceptionally well in July and early August, did not come up to expectations on account of the unusually dry weather for this season, which continued well into October.

Corn was below the usual crop, doing very poorly the first part of the season, but improving considerably through August and September.

While the apple crop was not quite as low relatively as in other apple-growing sections of the province, it was by no means up to former years, particularly the late varieties, possibly due to frost on June 5 and 6, while the trees were in full bloom. The same would apply to strawberries, which realized not more than half the crop that had been gotten in some past years.

I have again much pleasure in taking this opportunity to acknowledge the services of Mr. Thomas Coates, farm foreman, and Mr. Robert Donaldson, herdsman, who have so ably assisted me in their respective divisions.

EXPERIMENTS WITH SPRING WHEAT.

Ten varieties of spring wheat were sown in uniform test plots of one-fortieth acre each. The land was a clay loam on which roots had been grown the previous year (1909), for which crop, barnyard manure at the rate of twenty tons per acre had been applied. No manure or other fertilizer was used for this crop.

The land was ploughed in the fall of 1909, well worked up in the spring (1910), and sown May 11, with seed selected from picked heads of the previous year's crop, sown at the rate of one and three-quarter bushels per acre, together with common red clover, seven lbs.; alsike clover, three lbs., and timothy seed, twelve lbs. per acre.

From the time sown, for the first six weeks, the weather was very suitable for growth, being moderately warm, with plenty of rain. The crop gave excellent promise up to this time. Unusually dry weather setting in about July 15, interfered with the full measure of growth which might have been expected. Nevertheless the crops were above the average.

There was neither rust nor smut.

The following were the yields obtained:

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	White Fife	Sept. 6	118	49	10	3	3,160	52	40	61·5
2	Marquis	" 3	115	42	10	2¾	3,120	52	..	64·2
3	Red Fife	" 5	117	44	10	2¾	2,960	49	20	63·2
4	Huron	" 3	115	43½	10	2½	2,920	48	40	64·0
5	Stanley	" 6	118	48	10	2¾	2,720	45	20	62·0
6	Pringle's Champlain	" 3	115	44	10	2½	2,640	44	..	63·0
7	Chelsea	" 1	113	38	10	2¾	2,600	43	20	63·6
8	Preston	" 3	115	43	10	2¼	2,560	42	40	62·6
9	Bishop	" 1	113	42	10	2¾	2,200	36	40	61·0
10	Bobs	" 3	115	40	10	2¾	2,160	36	..	62·6

FIELD CROP OF WHEAT.

One acre of Early Riga wheat was sown.

This was grown on a clover sod, the soil being a clay loam in a fairly good state of fertility, having grown clover hay at the rate of two and one-half tons per acre the previous year, no manure having been applied since 1905. The land was ploughed in the fall of 1909, and seeded at the rate of one and three-quarters bushels per acre. It was sown May 14, harvested September 6, and yielded thirty-six bushels per acre.

EXPERIMENTS WITH DURUM OR MACARONI WHEAT.

Four varieties of Durum or Macaroni wheat were also grown in uniform test plots of one-fortieth acre each.

The land was similar to that on which the other spring wheats were sown and received the same treatment throughout. The seed was sown May 12.

MACARONI OR DURUM WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.	
				Inches.		Inches.	Lbs.	Bush.	Lbs
1	Yellow Gharnovka	Sept. 6	117	48	10	2¼	3,000	50	00
2	Roumanian	" 6	117	46	10	2½	2,680	44	40
3	Goose	" 1	112	40	10	2¼	2,440	40	40
4	Mahmoudi	" 6	117	48	10	2¼	2,240	37	20

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties each of Emmer and of Spelt were sown on one-fortieth acre plots on May 12.

The land was similar in character to that on which the spring wheats were sown, and received the same treatment throughout.

The yields from these plots are given in pounds, as, with the ordinary threshing machines, the chaff is not separated from the kernels, and the result cannot well be compared with the other sorts of wheat, which are threshed clean.

The following were the yields obtained:—

EMMER AND SPELT—Test of Varieties.

No.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.
				Inches.		Inches.	Lbs.
1	White Spelt	Sept. 7	118	45	10	$3\frac{1}{3}$	3,500
2	Red Spelt	" 7	118	46	10	$3\frac{1}{3}$	3,120
3	Red Emmer	" 6	117	42	10	$2\frac{1}{2}$	2,680
4	Common Emmer	" 1	112	38	10	$1\frac{3}{4}$	2,600

EXPERIMENTS WITH OATS.

Eighteen varieties of oats were sown in uniform test plots of one-fortieth acre each. The ground was a clay loam on which roots (turnips) had been grown the previous year, 1909, for which crop barn-yard manure at the rate of twenty tons per acre was used. The land was ploughed in the fall, well worked up in the spring until a fine tilth was made, and the seed sown at the rate of from two to two and a half bushels per acre, according to the size of the seed. Clover and timothy were also sown, common red clover at the rate of seven lbs. per acre; alsike clover three lbs. per acre; and timothy seed at the rate of twelve lbs. per acre.

The grain used for seed was from selected heads of the previous year's crop, selected and cut at harvest time.

This crop was sown May 12.

No fertilizer of any kind was used in these plots.

The grain started uniformly and well and gave unusually good promise for a time, but owing to very dry weather at the latter part of the season and to a considerable amount of lodging, only a fairly good result was obtained. There was no rust and very little smut.

The following were the yields produced:—

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	White Giant	Aug. 24	104	50	8	8	3,160	92	32	35·0
2	Golden Beauty	" 25	105	47	8	8½	3,080	90	20	32·5
3	Swedish Select	" 25	105	50	4	8½	3,000	88	08	32·6
4	Danish Island	" 25	105	47	8	8	2,980	87	22	32·0
5	Pioneer	" 22	102	48	9	8	2,960	87	02	37·3
6	Wide Awake	" 27	107	47	7	8	2,920	85	30	33·2
7	Improved Ligowo	" 24	104	50	4	8	2,880	84	24	33·1
8	Siberian	" 29	109	51	4	8½	2,840	83	18	32·5
9	Lincoln	" 29	109	47	8	7½	2,800	82	12	33·0
10	Thousand Dollar	" 24	104	48	4	8	2,720	80	..	33·4
11	Banner	" 23	103	48	8	8	2,680	78	28	31·0
12	Twentieth Century	" 25	105	50	8	8	2,640	77	22	34·0
13	Abundance	" 24	104	48	8	8	2,640	77	22	33 0
14	Virginia White	" 24	104	48	8	8	2,620	77	02	32·5
15	Irish Victor	" 25	105	47	8	7	2,600	76	16	32·5
16	Abundance, "Garton's Regenerated."	" 24	104	48	7	7½	2,400	70	20	30·0
17	Gold Rain	" 23	103	48	7	7½	2,240	65	30	31·6
18	Improved American	Sept. 5	116	53	4	9½	2,080	61	06	32·2

FIELD CROP OF OATS.

Three acres of oats were grown in one lot. The field was a light clay loam in a fairly good state of fertility, having grown ensilage corn the previous year, for which crop, barn-yard manure at the rate of twenty tons per acre had been used.

The variety of oats used was Black Tartarian. It was sown May 13, cut August 30, and yielded at the rate of 61 bushels 17 lbs. per acre.

FIELD CROP OF OATS ON MARSH.

Three acres of oats were grown on ordinary marsh or dyke land, on which timothy had been grown for a long term of years. This land was ploughed in the fall of 1909, and the seed sown May 21 (1910) at the rate of two and a half bushels per acre. The variety used was Pioneer.

This crop made very indifferent growth from the first, particularly on lower parts, the weather being unusually cold and wet at this season. The field was on a rather low part of the marsh (possibly the lowest) and owing to the breaking of dykes the past season, and the repeated flooding with salt water, no doubt had an unusual amount of salt in the soil, which, we believe, to some extent accounted for the rather indifferent growth all through the season. This field gave a total yield of 75 bushels.

FIELD CROPS OF OATS AND MIXED GRAIN.

Eight acres of oats and mixed grain were grown in four lots (four acres Black Tartarian oats; one acre Pioneer oats; one acre Waverley oats; and two acres mixed grain) made up of Sensation oats 2 bushels; Odessa barley 1 bushel; and Golden Vine peas ½ bushel, by weight, and sown at the rate of three bushels per acre.

The land was a light clay loam on which roots (turnips) had been grown the previous year, for which crop manure had been applied at the rate of twenty tons per acre. This was ploughed in the spring (having been entirely too wet the previous fall to be ploughed) and was sown May 24.

The following were the yields obtained:—

Crops.	Yield per Acre.		Weight per Bushel.
	Bush.	Lbs.	Lbs.
4 Acres Black Tartarian Oats	67	08	34
1 " " Pioneer "	63	18	34
1 " Waverley Oats	60	32	34
2 " Mixed grain	45	10	40

FIELD CROPS OF OATS, BARLEY AND MIXED GRAIN.

Five acres of oats, barley and mixed grain were sown in one field. The soil was a clay loam in a fairly good state of fertility, having grown clover hay at the rate of two and one-half tons per acre the previous year, no manure having been applied since 1905. The land was ploughed in the fall of 1909, and sown May 24, 1910.

The following were the yields obtained:—

Crops.	Yield per Acre.		Weight per Bushel.
	Bush.	Lbs.	Lbs.
1 Acre Sensation Oats	65	32	34
1 " Black Tartarian Oats	56	20	34
1 " Banner Oats	65	..	34
1 " Odessa Barley	25	..	48
1 " Mixed grain	54	20	40

EXPERIMENTS WITH BARLEY.

Twenty-one varieties of barley, eleven of six-rowed and ten of two-rowed, were grown in uniform test plots of one-fortieth acre each.

The land was a light clay loam on which root crops had been grown the previous year (1909), for which crop barn-yard manure at the rate of twenty tons per acre had been used. No manure or other fertilizer was used for this crop.

The land was ploughed in the fall of 1909, thoroughly worked up in the spring (1910) and sown May 13, at the rate of two bushels per acre. Timothy and clover seed were also sown with the grain at the rate of seven lbs. common red clover; three lbs. alsike clover and twelve lbs. timothy per acre.

The oats used were from selected heads of the previous season's crop.

There was no rust and practically no smut.

One variety of two-rowed barley (Hannchen), seemed to attract birds (sparrows), to such an extent, that we estimate this variety to have been at least one-half destroyed.

The yields from both two-rowed and six-rowed barleys are as follows:—

Six-Rowed Barley.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches		Inches	Lbs.	Bush.	Lbs.	Lbs.
1	Stella	Aug. 19	98	42	10	1¾	2,880	60	..	53·4
2	Oderbruch	" 15	94	43	8	2¼	2,720	56	32	52·0
3	Nugent	" 17	96	40	10	2½	2,600	54	08	52·0
4	Mansfield	" 17	96	44	7	2	2,520	52	24	52·0
5	Odessa	" 15	94	42	8	2¼	2,500	52	04	51·1
6	Mensury	" 17	96	38	4	2½	2,400	50	..	49·7
7	O.A.C. No. 21	" 17	95	44	10	2	2,360	49	08	50·0
8	Yale	" 17	96	44	10	2¼	2,340	48	36	51·0
9	Trooper	" 17	96	44	8	2½	2,320	48	16	52·0
10	Claude	" 17	96	42	10	2	2,240	46	32	53·0
11	Albert	" 17	96	40	10	2¼	2,180	43	16	52·7

Two-Rowed—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches		Inches	Lbs.	Bush.	Lbs.	Lbs.
1	Invincible	Aug. 22	101	49	10	2¾	2,840	59	08	54·0
2	Swedish Chevalier	" 23	102	42	5	3½	2,480	51	32	55·0
3	Jarvis	" 22	101	46	10	2½	2,440	50	40	54·2
4	Clifford	" 22	101	47	10	2½	2,360	47	24	54·0
5	Danish Chevalier	" 23	102	42	5	3¼	2,200	45	40	54·3
6	Standwell	" 22	101	47	10	2½	2,080	43	16	51·1
7	Canadian Thorpe	" 22	101	46	10	2¾	1,920	40	..	51·8
8	French Chevalier	" 23	102	42	5	3¼	1,880	39	08	56·0
9	Beaver	" 22	101	43	5	3¼	1,840	38	16	52·8
10	Hannchen	" 22	101	41	8	2¾	1,200	25	..	53·6

EXPERIMENTS WITH PEAS.

Thirteen varieties of peas were sown on test plots of one-fortieth acre each.

The land was a clay loam in a rather poor state of fertility, no manure having been used on this land for quite a number of years, and on which timothy and clover hay had been grown the previous year. This was ploughed in the fall of 1909, and sown June 3 at the rate of from two to three bushels per acre according to the size of the pea. Timothy and clover seed were also sown at the rate of seven lbs. common red clover; three lbs. alsike clover, and twelve lbs. timothy seed per acre.

The pea crop made very indifferent growth in the early part of the season, but improved materially later.

The following were the yields obtained:—

PEAS—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening	Number of Days Maturing.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after Cleaning.
					Lbs.	Bush.	Lbs	Lbs.
1	Picton	Medium	Sept. 14	101	1,960	32	40	63
2	White Marrowfat	Large	" 12	103	1,840	30	40	64
3	Prussian Blue	Medium	" 14	101	1,820	30	20	65
4	Daniel O'Rourke	Small	" 12	101	1,800	30	..	63
5	Mackay	Medium	" 12	101	1,780	29	40	62·5
6	Gregory	Large	" 14	103	1,600	26	40	61·5
7	Arthur	Medium	" 12	101	1,520	25	20	62·4
8	Chancellor	Small	" 12	101	1,480	24	40	63·3
9	English Grey	Medium	" 12	101	1,400	23	20	63
10	Black-Eye Marrowfat	Large	" 12	101	1,360	22	..	62·5
11	Golden Vine	Small	" 12	101	1,240	20	40	64
12	Paragon	Medium	" 12	101	1,120	18	40	62·8
13	Prince	Medium	" 14	103	1,080	18	..	62·8

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were grown in uniform test plots of one-fortieth acre each.

The ground was a clay loam, in only a moderate state of fertility, on which clover and timothy had been grown the previous season. This was ploughed in the fall of 1909, well worked up in the spring of 1910, and sown June 3 at the rate of one bushel per acre.

The following yields were obtained:—

BUCKWHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points	Yield of Grain per Acre.	Yield of Grain per Acre.	
				Inches.		Lbs.	Bush	Lbs.
1	Rye-Buckwheat	Aug. 25	83	38	7	3,000	62	24
2	Silverhull "	" 25	83	38	10	2,720	56	32
3	Grey "	" 25	83	36½	10	2,680	55	40
4	Japanese "	" 25	83	38	8	2,640	55	..
5	Tartarian "	" 25	83	36	7	2,440	50	40

FIELD CROP OF BUCKWHEAT.

Six acres of buckwheat (Silverhull) were grown. The land was a heavy clay loam in a rather poor state of fertility, not having had any manure for quite a number of years. It was uneven in character and surface, and had been in timothy and clover hay the previous season.

The seed was sown June 25 and harvested September 12.

The total yield was 205 bushels, or at the rate of 34 bushels 8 lbs. per acre.

EXPERIMENTS WITH INDIAN CORN.

Nine varieties of Indian corn for ensilage purposes were sown in uniform test plots.

The land was a light sandy loam on which a grain crop had been grown the previous season. This was ploughed in the fall of 1909, cultivated in the spring of 1910. barn-yard manure at the rate of twenty tons per acre spread on the surface and ploughed under lightly. This was again cultivated, and duplicate plots in rows thirty-six inches apart, and in hills thirty-six inches each way, sown. This was gone over with a smoothing harrow at least twice before the plants came through the ground.

Those in the rows were thinned out to from four to six inches apart, and those in the hills to from three to six plants in each hill.

This crop made very indifferent growth in the early part of the season, but improved considerably in the latter part.

The yield was calculated from the weight obtained from two rows, each sixty-six feet long.

The crop was sown June 13 and cut October 3.

This crop was not well matured.

Following were the yields obtained:—

INDIAN CORN FOR ENSILAGE—Test of Varieties.

Number.	Name of Variety.	Average Height.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
		Inch.		Tons.	Lbs.	Tons.	Lbs.
1	Early Mastodon	80	Early milk	16	450	16	1,550
2	Wood's Northern Dent	74	Late milk	15	470	14	1,700
3	Selected Leaming	72	"	15	250	13	1,730
4	Angel of Midnight	66	Glazed	14	1,150	15	360
5	Eureka	80	Watery	14	600	16	1,220
6	Compton's Early	72	Glazed	12	860	15	1,400
7	Longfellow	74	"	12	750	16	670
8	Superior Fodder	80	Watery	12	640	14	1,070
9	Davidson	66	"	12	200	12	1,360

FIELD CROP OF INDIAN CORN.

One acre of Indian corn was grown, the variety Longfellow being used. The land was a light sandy loam, in rather a poor state of fertility, on which grain had been grown the previous year. It was ploughed in the fall of 1909, cultivated in the spring of 1910, and a dressing of barn-yard manure at the rate of twenty tons per acre was spread on the surface and ploughed under lightly. This was well cultivated again and sown in rows thirty-six inches apart. The surface was harrowed twice before the plants came up, and cultivated between the rows at various times during the season. The corn was sown June 13, and cut October 13. The early part of the season was cold and wet, hence the crop made a rather poor growth and was not well matured. The yield was twelve and a half tons.

EXPERIMENTS WITH TURNIPS.

Ten varieties of turnips were sown in uniform test plots, in duplicate sets, two weeks apart.

The land was a clay loam on which had been a grain crop the previous year, 1909, with clover in the year 1908.

The land was ploughed in the fall of 1909, well cultivated in the spring and barn-yard manure spread on the surface at the rate of twenty tons per acre. This was ploughed under and again thoroughly cultivated. Commercial fertilizer (made up in the proportion of superphosphate 1½ lbs.; bone meal 1½ lbs.; nitrate of soda 1 lb.; muriate of potash 1 lb.;) mixed together and sown at the rate of three hundred lbs. per acre was then spread on the surface and harrowed in with the smoothing harrow.

The rows were twenty-four inches apart, and the plants thinned out to about one foot apart in the rows. The first set of plots were sown June 6, and the second set on June 20.

Besides thinning, they were gone over with the hoe once, and cultivated, with a one-horse cultivator, between the rows at least four times.

The yield was calculated from that obtained from two rows, each sixty-six feet long.

The crop was pulled October 17, with the following results:—

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre 1st Sowing.		Yield per Acre 1st Sowing.		Yield per Acre 2nd Sowing.		Yield per Acre 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hartley's Bronze	30	885	1,014	45	28	100	935	..
2	Halewood's Bronze Top	28	1,770	962	30	24	1,995	833	15
3	Hall's Westbury	28	1,255	954	15	19	775	646	15
4	Magnum Bonum	27	1,770	929	30	19	1,765	662	45
5	Mammoth Clyde	25	1,480	858	..	20	260	671	..
6	Good Luck	25	1,150	852	30	22	1,375	756	15
7	Bangholm Selected	25	820	847	..	24	1,830	830	30
8	Jumbo	23	1,190	786	30	20	1,415	690	15
9	Perfection Swede	22	715	745	15	21	75	701	15
10	Carter's Elephant	21	1,725	728	45	17	650	577	30

FIELD CROP OF TURNIPS I.

Eight acres of turnips were grown in lots of one acre each, in one field, the land varying from sandy loam on one side to a very white sandy loam on the other side. The previous crop was buckwheat. The land was ploughed in the fall of 1909, well worked up in the syprin, and barn-yard manure, at the rate of twenty tons per acre, spread on the surface and ploughed under lightly with the gang plough. It was again thoroughly cultivated and the rows run up twenty-four inches apart, as far as possible from twenty-four to forty-eight hours ahead of seeding time. To one half of each acre was added commercial fertilizer (superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.), at the rate of three hundred lbs. per acre, and to the other half of each acre, barn-yard manure only.

The comparison of varieties in this case is not very reliable, as the weather was extremely broken at the time of sowing, and, beginning at the side of the field where the soil was in the better condition, a certain number of days elapsed between the sowing of the first acre and that of the last acre.

Until about the first of August this crop made very satisfactory growth; from this out the continued extremely dry weather was very unfavourable for this crop, particularly that of the latest sown.

The following table shows the results:—

FIELD CROPS OF TURNIPS I.

Name of Variety, how Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Magnum Bonum—(Sown June 16—Pulled Nov. 8).					
½ acre manure and fertilizer, 300 lbs. per acre		25	..	833	20
½ " only		23	60	767	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 65 bush. 40 lbs. at 6 cts	3 94				
Loss per acre	$ 0 86				
Rennie's Prize—(Sown June 16—Pulled Nov. 8).					
½ acre manure and fertilizer, 300 lbs per acre		26	880	881	20
½ " only		23	240	770	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 110 bush. 40 lbs. at 6 cts	6 64				
Gain per acre	$ 1 84				
Hartley's Bronze—(Sown June 17—Pulled Nov. 8).					
½ acre manure and fertilizer, 300 lbs. per acre		23	790	779	50
½ " only		22	300	738	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 41 bush. 30 lbs. at 6 cts	2 49				
Loss per acre	$ 2 31				
Kangaroo—(Sown June 17—Pulled Nov. 9).					
½ acre manure and fertilizer, 300 lbs per acre		23	1,900	798	20
½ " only		21	680	711	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 87 bush. at 6 cts.	5 22				
Gain per acre	$ 0 42				
Canadian Gem—(Sown June 21—Pulled Nov. 10).					
½ acre manure and fertilizer, 300 lbs. per acre		23	1,310	788	30
½ " only		21	1,770	729	30
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 59 bush. at 6 cts.	3 54				
Loss per acre	$ 1 26				
Best of All—(Sown June 27—Pulled Nov. 12).					
½ acre manure and fertilizer, 300 lbs. per acre		23	1,620	793	40
½ " only		23	1,380	789	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 4 bush. at 6 cts.	0 24				
Loss per acre	$ 4 56				

FIELD CROPS OF TURNIPS I—*Concluded.*

Name of Variety, how Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
Elephant—(Sown June 27—Pulled Nov. 14).		Tons.	Lbs.	Bush.	Lbs.
½ acre manure and fertilizer, 300 lbs. per acre		21	1,160	719	20
½ " only		20	1,340	689	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 30 bush. 20 lbs. at 6 cts	1 82				
Loss per acre	$ 2 98				
Purple Top—(Sown June 27—Pulled Nov. 15).					
½ acre manure and fertilizer, 300 lbs per acre		20	1,420	690	20
½ " only		20	120	668	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 21 bush. 40 lbs. at 6 cts	1 30				
Loss per acre	$ 3 50				

FIELD CROPS OF TURNIPS II.

Two acres of turnips were grown in eight lots of one-fourth of an acre each. The land was a clay loam, the previous crop having been grain. This was ploughed in the fall of 1909, well cultivated in the spring and barn-yard manure spread on the surface at the rate of twenty tons per acre. This was ploughed under and again thoroughly cultivated. To one-half of each quarter acre, commercial fertilizer (made up in the proportion of superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.) at the rate of three hundred lbs. per acre was added, the other half of each quarter acre receiving barn-yard manure only.

Besides thinning, they were gone over with the hoe once, and cultivated with a one-horse cultivator between the rows at least four times during the season.

The following table shows the results obtained:—

FIELD CROPS OF TURNIPS II.

Name of Variety, how Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
Bangholm Selected—(Sown June 11—Pulled Oct. 18).		Tons.	Lbs.	Bush.	Lbs.
⅛ acre manure and fertilizer, 300 lbs. per acre		25	1,920	865	20
⅛ " only		23	1,280	788	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 77 bush. 20 lbs. at 6c.	4 64				
Loss per acre	0 16				

FIELD CROPS OF TURNIPS II—*Concluded.*

Name of Variety, how Fertilized, Size of Plot.		Yield per Acre.		Yield per Acre.	
		Tons.	Lbs.	Bush.	Lbs.
Mammoth Clyde—(Sown June 11—Pulled Oct. 18).					
⅛ acre manure and fertilizer, 300 lbs. per acre		25	80	834	40
⅛ " only		24	1,520	825	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 9 bush. 20 lbs. at 6c.	0 56				
Loss per acre	4 24				
Elephant Improved—(Sown June 11—Pulled Oct. 18).					
⅛ acre manure and fertilizer, 300 lbs per acre		25	160	836	..
⅛ " only		24	1,600	826	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 9 bush. 40 lbs. at 6c.	0 58				
Loss per acre	4 22				
Jumbo—(Sown June 11—Pulled Oct. 18).					
⅛ acre manure and fertilizer, 300 lbs. per acre		26	960	882	40
⅛ " only		26	400	873	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 9 bush. 20 lbs. at 6c.	0 56				
Loss per acre	4 24				
Halewood's Bronze Top—(Sown June 11—Pulled Oct. 18).					
⅛ acre manure and fertilizer, 300 lbs. per acre		27	1,400	923	20
⅛ " only		27	360	906	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 17 bush. 20 lbs. at 6c.	1 04				
Loss per acre	3 76				
Kangaroo—(Sown June 11—Pulled Oct. 25).					
⅛ acre manure and fertilizer, 300 lbs. per acre		28	720	945	20
⅛ " only		26	80	868	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 77 bush. 20 lbs. at 6c.	4 64				
Loss per acre	0 16				
Good Luck—(Sown June 11—Pulled Oct. 25).					
⅛ acre manure and fertilizer, 300 lbs. per acre		28	120	935	20
⅛ " only		26	1,880	898	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 37 bush. 20 lbs. at 6c.	2 24				
Loss per acre	2 56				
Sutton's Champion—(Sown June 11—Pulled Oct. 27).					
⅛ acre manure and fertilizer, 300 lbs. per acre		25	1,760	862	40
⅛ " only		25	1,520	858	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 4 bush. at 6c.	0 24				
Loss per acre	4 56				

EXPERIMENTS WITH MANGELS.

Eight varieties of mangels were sown in uniform test plots in duplicate sets.

The land was a clay loam in a fairly good condition, on which wheat had been grown the previous year. This was ploughed in the fall of 1909, well cultivated in the spring of 1910 and barn-yard manure at the rate of twenty tons per acre spread on the surface and ploughed under with a gang plough. This was again thoroughly cultivated and commercial fertilizer (made up of superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.), mixed together and sown at the rate of three hundred pounds per acre was spread on the surface and harrowed in with a smoothing harrow.

The seed was sown in rows twenty-four inches apart with a Planet Jr. hand drill in bunches of from three to six seeds in each, and one foot apart. When the plants were from two to four inches high they were thinned out, leaving one plant in each spot. This gives an opportunity for selection of plants, always having the selected one in the proper place. Besides this thinning, they were gone through twice with a hoe, and cultivated from time to time, at intervals of about a week.

The first set of plots were sown June 3, and the duplicate set June 17, and all were pulled October 12.

The yield was calculated from that obtained from two rows, each sixty-six feet long.

The following were the yields obtained:—

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre, 1st Sowing.		Yield per Acre, 1st Sowing.		Yield per Acre, 2nd Sowing.		Yield per Acre, 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Intermediate	32	350	1,072	30	23	200	770	..
2	Giant Yellow Globe	32	20	1,067	..	21	1,395	723	15
3	Gate Post	31	1,195	1,053	15	21	1,725	728	45
4	Perfection Mammoth Long Red	30	1,380	1,023	..	21	900	715	..
5	Yellow Intermediate	30	720	1,012	..	22	715	745	15
6	Half Sugar White	30	555	1,009	15	23	530	775	30
7	Selected Yellow Globe	29	1,070	984	30	21	75	701	15
8	Prize Mammoth Long Red	28	1,255	954	15	22	1,375	756	15

FIELD CROPS OF MANGELS.

One acre of mangels was grown in four lots of one-quarter acre each.

The land was a clay loam in fairly good condition, having grown a crop of oats he previous year (1909), with clover hay in 1908.

The land was ploughed in the fall, cultivated well in the spring, and barn-yard nanure at the rate of twenty tons per acre spread on the surface, ploughed under, and gain well cultivated.

To one half of each quarter-acre plot was added commercial fertilizer (superphoshate, 1½ lbs.; bone meal, 1½lbs.; nitrate of soda, 1 lb. muriate of potash, 1 lb.), at the ate of three hundred lbs. per acre, the other half of each plot receiving the barn-yard anure only. The seed was sown with the Planet Jr. seed drill in bunches of from hree to six seeds in each bunch, and one foot apart. Those were later thinned out, eaving one plant in each spot, and cultivated between the rows with a one-horse ultivator four times during the season, and hoed twice.

FIELD CROPS OF MANGELS.

Name of Variety, how Fertilized, Size of Plot.		Yield per Acre. Tons.	Yield per Acre. Lbs.	Yield per Acre. Bush.	Yield per Acre. Lbs.
Mammoth Long Red—(Sown June 7—Pulled Oct. 13).					
⅛ acre manure and fertilizer, 300 lbs. per acre		18	...	600	..
⅛ " only		14	400	473	20
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 126 bush. 40 lbs. at 6 cts.	7 60				
Gain per acre	$ 2 80				
Yellow Half-Long—(Sown June 7—Pulled Oct. 13).					
⅛ acre manure and fertilizer, 300 lbs. per acre		17	640	577	20
⅛ " only		14	480	474	40
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 112 bush. 40 lbs. at 6 cts.	6 16				
Gain per acre	$ 1 36				
Yellow Globe—(Sown June 7—Pulled Oct. 13).					
⅛ acre manure and fertilizer, 300 lbs. per acre		20	800	680	..
⅛ " only		14	1,400	490	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 190 bush. at 6 cts.	11 40				
Gain per acre	$ 6 60				
Golden Tankard—(Sown June 7—Pulled Oct. 13).					
⅛ acre manure and fertilizer, 300 lbs. per acre		13	1,200	453	..
⅛ " only		10	1,960	366	..
Cost per acre of 300 lbs. fertilizer at $32 per ton	$ 4 80				
Value per acre in crop over manure only, 87 bush. 20 lbs. at 6 cts.	5 24				
Gain per acre	$ 0 44				

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown in uniform test plots on June 6, and a duplicate set June 20.

The land was a clay loam in fairly good condition, on which grain had been grown the previous year. This was ploughed in the fall of 1909, well cultivated in the spring of 1910, and barn-yard manure at the rate of twenty tons per acre spread on the surface and ploughed under with a gang plough. It was again thoroughly cultivated and commercial fertilizer made up of (superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.) mixed together and sown at the rate of three hundred pounds per acre was spread on the surface, and harrowed in with a smoothing harrow.

The seed was sown in rows twenty-four inches apart, and the plants thinned out by hand to about three inches apart in the rows.

The yield was calculated from that obtained from two rows, each sixty-six feet long.

The following were the crops obtained:—

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre, 1st Sowing.		Yield per Acre, 1st Sowing.		Yield per Acre, 2nd Sowing.		Yield per Acre, 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	18	1,950	632	30	16	1,660	561	..
2	Improved Short White	17	650	577	30	16	1,165	552	45
3	White Belgian	16	1,330	555	30	15	360	506	..
4	Ontario Champion	16	505	541	45	15	1,020	517	..
5	Half-long Chantenay	13	1,390	456	30	12	1,410	423	30

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were sown in uniform test plots in duplicate lots.

The land was a heavy clay loam in a fairly good condition, on which wheat had been grown the previous year. This was ploughed in the fall of 1909, well cultivated in the spring of 1910, and barn-yard manure at the rate of twenty tons per acre spread on the surface and ploughed under with a gang plough. It was again thoroughly cultivated and commercial fertilizer, made up of (superphosphate, 1½ lbs.; bone meal, 1½ lbs.; nitrate of soda, 1 lb.; muriate of potash, 1 lb.), mixed together and sown at the rate of three hundred pounds per acre was spread on the surface and harrowed in with a smoothing harrow. The sugar beet seed was sown in rows twenty-four inches apart with a Planet Jr. hand drill, in bunches of from three to six in each, and one foot apart. When the plants were from two to four inches high, they were thinned out, leaving one plant in each spot. This gives an opportunity for selection of plants, always having the selected one in the proper place.

Besides this thinning, they were gone through twice with a hoe, and cultivated from time to time at intervals of about one week.

The first set of plots were sown June 3 and the duplicate set June 17, and all pulled October 12.

The yield was calculated from that obtained from two rows, each sixty-six feet long.

The following were the yields obtained:—

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre, 1st Sowing.		Yield per Acre, 1st Sowing.		Yield per Acre, 2nd Sowing.		Yield per Acre, 2nd Sowing.		Sugar in Juice.	Solids in Juice.	Coefficient of Purity.
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	%	%	
1	French Very Rich	16	175	536	15	13	1,225	453	45	14·92	17·40	85·8
2	Vilmorin's Improved	15	1,350	522	30	11	1,760	396	..	18·24	20·49	89·0
3	Klein Wanzleben	15	525	508	45	10	625	343	45	16.13	18·43	87·5

EXPERIMENTS WITH POTATOES.

Seventeen varieties of potatoes were grown in uniform test plots, a plot being two rows, each sixty-six feet long.

The ground was a heavy clay loam on which timothy hay had been grown the previous year. After the removal of the hay, barn-yard manure at the rate of twenty tons per acre was spread on the surface and ploughed in later in the fall (1909).

This was worked up well in the spring, ploughed, and again well worked up. Commercial fertilizer (made up of superphosphate, 1½ lbs.; bone meal 1½ lbs.; nitrate of soda 1 lb.; muriate of potash 1 lb.;) mixed together and sown at the rate of 400 lbs. per acre was applied by scattering on the open rows before planting. The rows were thirty inches apart and the sets were planted one foot apart in the rows. The drills were harrowed down and rowed up again before the plants came up.

Bordeaux mixture was used three times, Paris green being added on one occasion.

There was much more rot than usual in this crop.

They were planted June 15, and dug October 3.

The following were the yields obtained:—

Potatoes—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Vick's Extra Early	514	43	431	12	83	36	387	12	127	36	Long, white.
2	Rochester Rose	415	48	402	36	13	12	341	..	74	48	Oblong, dark pink
3	Ashleaf Kidney	382	48	338	48	44	..	277	12	105	36	Round, flat, white.
4	American Wonder	376	12	237	36	138	36	178	12	198	..	Long, "
5	Gold Coin	367	24	288	12	79	12	250	48	116	36	Oval, "
6	Money Maker	365	12	242	..	123	12	193	36	171	36	Long, "
7	Carman No. 1	363	..	239	48	123	12	200	12	162	48	Flat round, "
8	Reeve's Rose	360	48	325	36	35	12	259	36	101	12	Round, dark pink.
9	Empire State	332	12	220	..	112	12	180	24	151	48	Long, white.
10	Irish Cobbler	312	24	283	48	28	36	224	24	88	..	Round, "
11	Late Puritan	308	..	191	24	116	36	145	12	162	48	Long, "
12	Everett	305	48	235	24	70	24	154	..	151	48	Flat, round, "
13	Morgan Seedling	303	36	187	..	116	36	149	36	154	..	Oblong, pink.
14	Dreer's Standard	301	24	246	24	55	..	169	24	132	..	Round, white.
15	Dalmeny Beauty	281	36	248	36	33	..	175	24	101	12	" "
16	Hard to Beat	204	36	187	..	17	36	134	12	70	24	Flat, "
17	Factor	147	24	121	..	26	24	105	36	41	48	Round, "

CLOVER EXPERIMENTS.

Experiments were again conducted to determine the gains, if any, from growing clover with grain crops, by ploughing under the growth of clover made during the previous season.

This was a very light sandy soil in a fairly good state of fertility, having grown roots in 1907. It being the third season in which grain has been grown on this land, the difference in yield is the result of clover and no clover in the seasons of 1908 and 1909.

One-third of the land, the part where wheat was sown, had become so very full of weeds (Spurry) that it was thought wise to cut out this part of the experiment, leaving that of oats and barley only.

The following results were obtained:—

CLOVER EXPERIMENTS.

No.	Name of Variety and how Seeded.	Yield per Acre.	
	Banner Oats—(Sown May 14—Cut August 16).	Bush.	Lbs.
1	Without clover	50	20
2	With clover	57	22
3	Without clover	51	06
4	With clover	54	24
	French Chevalier Barley—(Sown May 14—Cut August 24).		
1	Without clover	44	08
2	With clover	49	08
3	Without clover	42	04
4	With clover	46	32

EXPERIMENTS WITH ALFALFA.

The alfalfa sown in 1909, while seeming to come through the winter better than usual, made rather indifferent growth, and was more or less patchy.

This was cut June 23, and a light cutting taken off; then left to grow for the remainder of the season, leaving a moderately good crop standing (probably about one ton per acre), in the fall, with some little seed.

EXPERIMENTS WITH RUN-OUT LAND.

The experiment to determine the practicability of restoring run-out land, where a limited amount of manure is available, was continued this season.

This was commenced in the season of 1906 on a field of eight acres of heavy clay with some little loam, badly run out and particularly deficient in humus. This field had grown grain, and had been sown to grass sixteen years previous, since when it had been lying in pasture, producing extremely little after the first three years. The field was made into four plots of two acres each.

With a view to making each plot as nearly equal in fertility as possible, the field was divided into eight parts of one acre each, and numbered 1 to 8, nos. 1 and 8 being designated plot 1 (2 acres); Nos. 2 and 7, plot 2 (2 acres); Nos. 3 and 6, plot 3 (2 acres); and Nos. 4 and 5, plot 4 (2 acres).

On plot 1, no fertilizer was used; on plot 2, three hundred lbs. commercial fertilizer per acre was used. On plot 3, six hundred lbs. commercial fertilizer per acre was used, and on plot 4, ten one-horse cart loads of barnyard manure per acre was used.

In the season of 1906, this field was sown with peas, oats and vetches, mixed together and sown at the rate of three bushels per acre. They were allowed to grow until about August 1, when the entire crop was ploughed under. This was repeated in 1907. In 1908, the land was sown with Waverley oats, Odessa barley, and Prussian Blue peas, mixed together and sown at the rate of three bushels per acre, together with clover and timothy at the rate of 10 lbs. clover and 12 lbs. timothy seed per acre. This was followed with clover hay in 1909 and again with mixed grain in 1910.

The following tables will show the results for each of the three years, 1908, 1909 and 1910:—

YIELD OF MIXED GRAINS, 1908.

No. of Plot.	How Fertilized.	Yield per Plot (2 acres).		Weight per Bushel.
		Bush.	Lbs.	Lbs.
1	No fertilizer used	61	04	40
2	300 lbs. fertilizer per acre	78	08	40
3	600 " "	82	05	40
4	10 one-horse cart-loads manure	95	04	40

YIELD OF HAY, 1909.

No. of Plot.	How Fertilized.	Yield per Plot (2 acres).	
		Tons.	Lbs.
1	No fertilizer used	2	190
2	300 lbs. fertilizer per acre	2	925
3	600 " "	2	1,275
4	10 one-horse cart-loads manure	3	325

YIELD OF MIXED GRAINS, 1910.

No. of Plot.	How Fertilized.	Yield per Plot (2 acres).		Weight per Bushel.
		Bush.	Lbs.	Lbs.
1	No fertilizer used	88	..	40
2	300 lbs. fertilizer per acre	105	..	40
3	600 " "	103	20	40
4	10 one-horse cart-loads manure	116	..	40

SPECIAL EXPERIMENTS WITH FERTILIZERS.

A series of tests with commercial fertilizers, the object being to gain information regarding the effects of the continued application of certain fertilizers and combinations of fertilizers on the more important farm crops, has been carried on.

These experiments were commenced in 1898, and continued for ten consecutive years, and reported in the annual report each year.

In 1909, this land was all sown to grain, with clover added. The original series of experiments were again carried on in the season of 1910.

The following are the results obtained:—

SPECIAL EXPERIMENTS WITH FERTILIZERS.

No.	Fertilizers used each year previous to 1904.	Banner Oats.		White Fife Wheat.		Logan Barley.		Mixed Grain.		Long-fellow Corn.		Purple Top Turnips.		Gold Coin Potato.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Manure, 30 tons.......	67	22	55	00	54	08	57	20	14	500	653	20	356	40
2	Manure, 15 tons; fertilizer 250 lbs.......	76	16	50	00	60	20	60	00	13	1,000	727	20	383	20
3	Complete fertilizer, 1000 lbs..................	47	02	46	40	50	00	48	30	12	..	590	00	240	00
4	" " 500 lbs.	52	32	41	40	45	40	47	20	11	..	568	20	306	40
5	Check, no fertilizer used	35	10	23	20	18	36	27	20	10	500	458	20	215	00
6	Bone meal, 1,000 lbs...	50	00	35	00	42	34	40	00	10	1,800	610	00	266	40
7	" 500 lbs...	47	02	31	40	35	20	47	20	11	500	575	00	286	40
8	Ashes, 2,500 lbs.	58	28	35	00	38	26	45	00	11	1,500	608	20	345	00
9	Manure, rotted, 20 tons	61	26	35	50	56	12	52	10	16	..	768	20	463	20
10	Check, no fertilizer used	33	18	10	00	16	32	25	00	2	1,000	68	20	175	00
11	Land plaster, 500 lbs..	44	04	17	30	19	38	32	20	5	500	193	20	206	40
12	Salt, 500 lbs	73	18	33	20	33	16	50	00	8	1,000	515	00	243	20
13	Marsh mud, 100 tons..	74	14	56	40	39	28	55	00	12	..	546	40	291	40
14	Manure, green, 20 tons.	83	28	45	00	58	12	62	20	17	500	830	00	530	00

SPECIAL EXPERIMENTS WITH LIME AND COMMERCIAL FERTILIZERS ON MARSH OR DYKE LANDS.

Special experiments were continued this season with lime and commercial fertilizers on marsh or dyke lands as in previous years. This was on a part of the marsh somewhat lower than the average and uneven in surface. The cold and wet in the early part of the season and the breaking of the dykes with repeated flooding with salt water the previous season, produced conditions so unfavourable that no particulars were kept of the results.

HAY CROP.

The hay crop was the heaviest cut for a good many years, both on upland and marsh.

—	Tons	Lbs.
23 acres on upland yielded..........................	62	..
45 " marsh "	92	..
Total....	154	..

SUMMARY OF CROPS GROWN, EXCLUSIVE OF UNIFORM TEST PLOTS OF GRAIN AND POTATOES.

HAY.

—	Tons.	Lbs.
Upland hay	61	1,915
Marsh "	92	1,780
	154	1,695

GRAIN.

—	Bush.	Lbs.	Lbs.
Mixed grain	540	..	22,560
Oats	869	27	29,573
Wheat	40	57	2,457
Barley	48	45	2,349
Buckwheat	205	..	9,840
			66,779

TURNIPS.

—	Bush.	Lbs.	Tons.	Lbs.
Turnips (field crop)	7,934	05	238	45
" (test plots)	96	52	2	1,812
	8,030	57	240	1,8·7

MANGELS.

—	Bush.	Lbs.	Tons.	Lbs.
Mangels (field crop)	514	10	15	850
" (test plots)	85	09	2	1,109
	599	19	17	1,959

CORN.

—	Tons.	Lbs.
Corn (field crop)	12	1,000
" (test plots)	2	737
	14	1,737

Nappan. Part of Hay Crop 1910.

FRUIT AND VEGETABLE CROPS.

APPLES.

The apple crop was the poorest for some years, this condition being general all over the province. Heavy frosts coming while the trees were in blossom, were to a certain extent responsible for this condition. The fruit was also not well matured.

STRAWBERRIES.

The strawberry crop was not by any means up to its usual standard. Coming through the winter in rather poor shape, the injury being confined more to spots of the field than to varieties, the comparative value of the following table is somewhat lessened.

A severe frost coming when the plants were in blossom also affected this crop very materially, the result being about one-half the usual yield.

The size of the plots of each variety were 16½ x 5 feet, or 1/528 acre.

The following are the yields of twenty of the most productive varieties this season:—

STRAWBERRIES—Test of Varieties.

Variety.	Dates when Picked.					Yield per Plot.	Yield per Acre.
	July 2.	July 6.	July 8.	July 12.	July 19.		
	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.	Qts.
Nick Ohmer	1	3	4	6	3	17	8,976
Jas. Vick	....	4	5	3	4½	16½	8,712
St. Antoine de Padua	1¼	5	3	3½	3¼	16	8,448
Capt. Jack	1½	4½	4	3	3	16	8,448
Equinox	3	5	3	2	2	15	7,920
Afton	2½	3	4	2	1½	13	6,864
Barton's Eclipse	1	2	2	3	2	10	5,280
Carrie	1½	1½	2	2	2	9	4,752
Senator Dunlap	3	2	2	1	1	9	4,752
H. W. Beecher	1	1	3	2	1	8	4.224
Woolverton	1	2	2	2	1	8	4,224
John Little	....	2	2	2	2	8	4,224
Hood River	....	1	2	2	2	7	3,696
Saunders	....	1	2	2	1	6	3,168
Pearl	1	1	2	1	1	6	3,168
Swindle	2	1	1	1	1	6	3,168
Beverly	1	1	1	2	1	6	3,168
Pocomoke	1	1	2	1	1	6	3,168
Thompson's Late	....	1	1	2	1	5	2,640
Lovett	1½	1	1½	1	....	5	2,640

PEAS.

Six varieties were sown on May 24. The varieties used were Little Marvel, American Wonder, Thomas Laxton, Stratagenm, Telephone and Gradus.

Little Marvel ripened earliest of all, followed by American Wonder, both kinds producing a good crop, with short vines and small pods well filled with large peas. Those varieties did not require staking. Thomas Laxton and Gradus ripened next (both early), the pods of which were long and well filled with large peas. Stratagem and Telephone are both late varieties.

The yields were as follows:—

Peas—Test of Varieties.

Variety.	Dates of Picking and Yields.						Total Yield from Plots.	
	Aug. 2.		Aug. 5.		Aug. 12.			
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Little Marvel	8	8	4	8	3	0	16	0
American Wonder	6	8	4	8	2	0	13	0
Thomas Laxton	6	0	4	0	3	0	13	0
Stratagem	5	0	3	0	4	8	12	8
Telephone	5	0	2	8	4	8	12	0
Gradus	6	8	2	0	1	0	9	8

BEANS.

Six varieties of garden beans were planted on May 24, the varieties used being Dwarf Extra Early, Fame of Vitry, Emperor of Russia, Matchless, Dwarf Wax and Golden Skinless.

The seed germinated slowly, the plants made very slow growth, owing to the wet cold weather in June, and only a fair crop of beans was harvested.

Dwarf Extra Early was the first variety ready for use (August 3); Emperor of Russia was the most prolific. All varieties ripened their seed, which was gathered in good condition.

The yields were as follows:—

Beans—Test of Varieties.

Variety.	Date of Picking and Yield.						Total Yield from Plots.	
	Aug. 2.		Aug. 9.		Aug. 16.			
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Emperor of Russia	4	4	10	8	6	8	21	4
Fame of Vitry	4	4	11	4	3	8	19	0
Dwarf Extra Early	8	0	8	0	2	8	18	8
Matchless	3	8	6	8	3	8	13	8
Dwarf Wax	3	0	8	0	2	0	13	0
Golden Skinless	4	8	5	4	3	0	12	12

PARSNIPS.

One variety of parsnips (Hollow Crown) was sown on May 25. This produced a fairly good crop of roots of marketable size.

CARROTS.

Two varieties of carrots (Amsterdam Scarlet and Early French Horn) were sown on June 3. The former variety produced the earlier and heavier crop of smooth, marketable roots. Ready for use August 6.

TURNIPS.

Two varieties of early turnips were sown (Early White Milan and Early White Flat Strapleaved) on June 10. The Early White Milan gave the smoother and earlier crop of roots. Ready for use August 6.

LETTUCE.

Four varieties of lettuce were sown on May 25. The varieties were Cos Trianon, Red Edged Victoria, Unrivalled Summer and Wheeler's Tom Thumb. All varieties grew well, but Unrivalled Summer proved superior in texture and flavour, and remained in head longer before going to seed, closely followed by Wheeler's Tom Thumb. Cos Trianon grew taller and more open, with longer leaves, and was coarser in quality.

RADISH.

Three varieties of radish were sown on May 25, Early Scarlet White Tipped, Forcing Turnip Scarlet and Winter Black Spanish. These all made satisfactory growth, the two former varieties being much freer from the ravages of the maggot than the latter, which was rendered unfit for use from that cause.

ONIONS.

Three varieties of onions were sown in the hotbed on April 13, and set out in the open ground on June 4. The varieties grown were Paris Silverskin, Large Red Wethersfield and Danver's Yellow Globe. These all made satisfactory growth and yielded a fair crop. For early use, the Paris Silverskin is most in demand, but does not seem to possess the keeping qualities of the Large Red Weathersfield.

BEETS.

Egyptian Flat Extra Early, Nutting's Dwarf Red, and Early Blood Red Turnip were the three varieties sown on June 3. For early use, the Egyptian Flat Extra Early is first. Ready for use August 9.

CUCUMBERS.

Three varieties were sown in the open ground, in beds, on June 11. White Spine, Long Green and Davis Perfect were the varieties used. For early use, the White Spine is recommended, followed by Long Green and later by Davis Perfect.

The fruit of the Spine and the Davis Perfect was from six to eight inches long, and that of the Long Green from ten to twelve inches long.

SQUASH.

Six varieties of squash, (Mammoth Whale, Hubbard, White Congo, Custard Marrow, Vegetable Marrow Yellow and Long White Bush Marrow) were grown. The seed was sown in beds 3 x 4 feet in the open on June 11. These made a fairly good growth. The White Bush Marrow was the first fit for use; the Hubbard is recommended for its keeping qualities.

CAULIFLOWER, CABBAGE, BRUSSELS SPROUTS AND BROCOLI.

Five varieties of cabbage (Paris Market Very Early, Extra Early Savoy, Large Late Flat Dutch, Early Jersey Wakefield, and Fottler's Improved Brunswick), two varieties of cauliflower (Early Snowball and Earliest Erfurt), one of brocoli (Extra Early White), and one of Brussels sprouts (Dwarf Improved), were sown in the hot-

bed on April 13, and set out in the open ground on June 10. When set out, the plants semed to be healthy, but later on all were gradually so badly affected by club-root that the entire crop was useless.

The Early Jersey Wakefield cabbage, and Early Snowball cauliflower developed some small heads, but not enough to keep any data of.

CORN.

Four varieties of garden corn were sown May 23, Malakoff, Golden Bantam, Early Cory and Canada Yellow. The crows proved very troublesome to this crop.

All varieties ripened well, the Malakoff first, Early Cory, Golden Bantam and Canada Yellow, in the order named. The ears of the first three named varieties were short, the Malakoff, although the most prolific, growing very short ones. The Canada Yellow, although last to ripen, gave a good crop of good-sized ears.

CELERY.

Three varieties of celery, Paris Golden Yellow, Rose Ribbed Paris and White Solid Pascal were sown in the hotbed on April 1, transplanted in the hotbed on May 25, and set out in trenches in the open on July 26. The weather was extremely dry after these plants were set out, and it was found necessary to water them, hence the growth for a long time was very slow, causing the size of the plants to be below the standard, although the quality was very good, particularly the Paris Golden Yellow. The Paris Golden Yellow and Rose Ribbed Paris are splendid fall and early winter varieties; the White Solid Pascal is a more vigorous grower than the other two, and is a good winter variety.

The first earthing was done on September 23, the second on October 1, and third on October 19; the plants were dug on October 30.

TOMATOES.

Ten varieties of tomatoes were sown in the hotbed on March 9, and transplanted in strawberry boxes into cold frames on May 31, and set out in the open on June 15.

All made good growth, producing a fairly good crop of well-made fruit.

Golden Queen formed some large smooth fruit, but rotted badly. Blight struck Sparks' Earliana (Burpee) at ripening time and this variety was pulled up. Towards the end of the season blight was noticed on nearly all varieties.

The following table shows the varieties grown and the yields from each:—

TOMATOES—Test of Varieties.

Variety.	Ripe Fruit.	Green Fruit.	Yield Per Plot.
	Lbs.	Lbs.	Lbs.
Spark's Earliana (Ottawa)	128	102	230
June Pink,	101	107	208
Coreless	97	84	181
Matchless	76	100	176
Chalk's Early Jewel	85	72	157
Ponderosa	71	80	151
Atlantic Prize	53	93	146
Livingstone's Beauty	45	91	136
Golden Queen	30	53	83
Spark's Earliana (Burpee)	Badly blighted		

HORSES.

Eight horses are at present on the Farm, kept exclusively as work animals, no experiment of any kind being carried on with them. Six of them are for draft purposes, one express horse and one driver. No change has been made in the number, although an exchange was made during the year in the case of the driver, for a younger animal. At least one draft horse will have to be added for the incoming year. All are in good condition.

CATTLE.

With a view to carrying on an experiment with dairy cows to demonstrate the value and practicability of grading up the common cows of the country by the use of a pure-bred bull of some of the established breeds of dairy cattle, twenty grade heifers one and a half years old were bought in December of this year. They are being bred in February and March, the intention being to commence this test about December 1, 1911. An Ayrshire bull was also procured for this experiment. We thus have on hand one Ayrshire bull and twenty grade heifers.

STEER FEEDING EXPERIMENTS.

As in past years, grade steers were put in in the fall for fattening purposes, with the intention of selling out again in the spring. They were bought in October and November, and the feeding experiment commenced December 1, they having been dehorned in the meantime. The number being fed is sixty-two head. The weight credited to them, at the beginning of the experiment, was the weight found at 9 a.m. without their having received any food from 7 p.m. the previous evening. Large quantities of roots and clover hay were fed for the first month, without any meal, reaching 60 lbs. of roots per steer per day. From December 31 to date the roots have been decreased 10 lbs. per day per steer each month, with meal, commencing January 1, 1 lb. increasing 1 lb. per steer per day each month.

In past years, after charging all foods consumed at market prices, whether bought or grown on Farm, a substantial profit has been made, particularly on those fed in the winter of 1909-10 (as per subjoined report of steers fed 1909-10), when the price paid was $4.65 per 100 lbs., and the price received at selling time was $6.50 per 100 lbs. This left an increased price of $1.90 per 100 lbs. The price paid this season, November, 1910, being so much in advance of previous years, leaves a serious doubt as to whether the results will give a profit or a loss.

No sale has as yet been made for spring delivery.

	Lbs.
Total live weight of 62 steers, December 1, 1910..........	70,745
Total live weight of 62 steers, March 15, 1911	81,205
Increase..........................	10,460
Average daily gain per steer..................	1·60

COMPLETION OF STEER-FEEDING EXPERIMENT, 1910, FINISHED SINCE LAST REPORT.

On making my report March 31, 1910, the 64 steers were still on hand.

The following is a continuation and conclusion of said experiment:—

COMPLETION OF STEER-FEEDING EXPERIMENT, 1910, FINISHED SINCE LAST REPORT.

	Lbs.
Total live weight of 64 steers Dec. 1, 1909	64,410
Total live weight of 64 steers March 31, 1910	77,675
Increase to March 31, 1910	13,265
Total live weight of 64 steers May 15, 1910	81,750
Increase to May 15, 1910	17,340

FINANCIAL RESULTS.

Original weight of 64 steers, 64,410 lbs. at 4·65 cts per lb		$2,994 90
Weight at finish of 61 steers, 78,600 lbs. at 6½ cts. per lb	$5,109 00	
Weight at finish of 3 steers, 3,150 lbs. at 6 cts per lb.	189 00	
		$5,298 00
Gross profit		$2,303 10
Cost of feed for lot 165 days		1,689 00
Net profit		$613 50
Daily rate of gain per steer		1·64 lbs.
Cost of 1 lb. gain		9·74 cts.
Cost of feed per day per steer		16 cts.
Profit per steer		$9 58

SHEEP.

Twenty-seven sheep are now in the pens, consisting of Shropshires, Leicesters, and their grades as follows:—

13 Shropshires.

9 Leicesters.

5 Grades.

POULTRY.

Four breeds of poultry are now on the Farm, *i.e.*, Barred Plymouth Rocks, White Wyandottes, Buff Orpingtons and White Leghorns.

The pens are made up as follows:—

	Cock.	Hens.
Barred Plymouth Rocks	1	10
White Leghorns	1	6
White Wyandottes	1	4
Buff Orpingtons	1	4

BEES.

When taken out of their winter quarters April 18, it was found that the bees had all wintered well. During the spring two colonies dwindled, one of them getting so weak that it was thought advisable to unite the two weak ones, which was done. This colony was only able to get built up during the summer. Brood rearing in the other colonies progressed very rapidly, consuming all stores, but a crop of crimson clover in the orchard, on which the bees worked well every fine day, enabled us to get along without having to feed them. The clover flow was heavier than the average, while the fall flow was not as good as usual.

Fourteen colonies were put into the cellar in good shape on December 5. The hives were prepared for the winter in the usual way, *i.e.*, the hives were raised from the bottom boards by having two inch blocks placed under them, the covers and quilts removed and three empty sacks put over each hive. At date of writing, all colonies are clustering and seem to have wintered well.

GRAIN AND POTATO DISTRIBUTION.

As in past years, grain and potatoes were distributed to farmers on application. The following number of 3 lb. sample bags were sent to the various applicants:—

Potatoes	280
Oats	314
Barley	71
Wheat	62
Buckwheat	87
Total number of samples sent out	814

EXHIBITIONS.

An exhibit of farm products was made at the Dominion Exhibition, St. John. N.B., the Yarmouth County Exhibition, Yarmouth, N.S., and the Nova Scotia Provincial Exhibition, Halifax, N.S.

I also attended the Summerside Exhibition, P.E.I., the Charlottetown Exhibition, P.E.I., the Westmorland and County Exhibition, Sackville, N.B., and the Windsor Exhibition, Windsor, N.S.

CORRESPONDENCE.

During the year 2,536 letters were received and 2,212 sent out, exclusive of reports and circulars sent out with samples of grain.

VISITORS.

At least the usual number visited the Farm during the year in many small picnic groups.

Train accommodations are very unsuitable for visitors to the Farm. So far we have not been able to get any improvement in this service.

WEATHER.

April, 1910, opened with a light rain on the first day, followed by fine weather lasting one week, during which we had nearly the maximum amount of sunshine. Rain again fell from the 8th to the 10th, followed by bright weather until the 20th, after which light rains fell nearly every day until the 29th, when the weather became clear and colder.

Rain fell on twelve different dates, the heaviest being on the 8th, when ·79 inches fell.

Frost was registered on the 2nd, 3rd, 4th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 29th and 30th, the lowest temperatures being on the 29th, when 10° of frost was registered.

May opened with three days of dull cloudy weather, followed by rain on the 5th and a light snow squall on the 6th, after which, until the 24th, the weather was bright and warm. Light rains fell nearly every day after the 24th, the heaviest rainfall being on the 5th, when ·59 inches fell.

Seeding commenced on the 10th. Two degrees of frost was registered on the 6th. and three degrees on the 8th, 16th and 17th respectively.

June was a very wet and unseasonably cold month. Rain fell on fourteen different dates, making a total precipitation of 3·72 inches.

The highest temperature was 77° on the 22nd, and on only five dates did the thermometer register above 70°.

On the 5th the mercury dropped to 31°, and to 32° on the 6th.

July did not register as high temperatures as usual; on only six different dates did the mercury go to 80° or higher, the highest being 84° on the 10th. At the same time the minimum temperatures were higher than usual, leaving the mean temperature for the month higher than that of the two preceding seasons.

A heavy rain (1·38 inches) fell on the 4th, the balance of the month being fine.

August was an extremely dry month, light rains falling on five different dates, making the low precipitation of only 1·55 inches, the lowest experienced here for some time. Low maximum temperatures were also recorded, the mean for the month being 62·33. The highest temperature was 79° on the 23rd, and the lowest 33° on the 31st.

September.—The first half of this month was very seasonable, and favourable for harvesting and for the growth of root crops. On the 19th, 20th and 26th, 2·10 inches of rain fell, the balance of the time the weather was fine. The maximum temperature for September was 74° on the 11th and 13th, and the minimum was 32° on the 25th.

October was quite seasonable for the first half of the month, and dull or rainy for the later half. The heaviest rainfall was on the 26th, when :86 inches fell. From the 25th until the 31st, no sunshine was recorded. The lowest temperature was 25° on the 14th.

November was a dull and rainy month. Sunshine was recorded on only twelve different dates, giving a total of eighty-five hours. Rain fell on ten different dates. the heaviest rainfall being 1·65 inches on the 27th. Frost was registered on the 1st, 2nd, 3rd, 9th, 10th, 13th, 14th, 16th and every night from the 19th to the 25th, the lowest temperature being 17° on the 22nd.

December.—A light snow fell on the 1st, followed by fair but dull weather until the 8th, during which time there was only four hours sunshine.

Three inches of snow fell on the 8th, one inch on the 14th and three inches on the 15th and 25th.

Rain fell on the 19th, 25th and 30th, the heaviest being on the 19th, when ·98 inches fell.

The thermometer registered 6°, 3°, 1°, zero, 2°, 4° and 2° below zero on the 14th, 15th, 16th, 17th, 18th, 19th and 31st respectively.

January was a very fine winter month. The ground was bare until the 27th, when two inches of snow fell, followed by six inches more on the 28th, making sleighing. Rain fell on the 3rd, 9th, and 30th, the heaviest being 1·64 inches on the 3rd.

February was one of the finest winter months ever experienced here. A slight thaw on the 4th of the month brought the mercury from 13° below zero to 43° above, but did not spoil sleighing. No great amount of snow fell (eight inches), but the steady cold weather held what did fall, and sleighing was fairly good all through the month. The thermometer registered below zero on the 1st, 2nd, 4th, 6th, 7th, 12th, 13th, 14th, 15th, 16th, 17th, 20th and 26th, the lowest being 19° below on the 13th. Rain fell on one day only (4th), when ·78 inches was recorded.

March opened with a light snow storm, followed by two fine days, then another light snow. From then until the 15th, the weather was bright and fine with a good amount of sunshine, taking all the snow off and breaking up sleighing. From the 15th on, the weather was broken with rain and snow storms nearly every day. A total of twelve inches of snow fell during this month.

METEOROLOGICAL RECORDS.

Month.	Degrees of Temperature—F.					Sunshine.
1910.	Highest.	Date.	Lowest.	Date.	Mean.	Hours.
April	71·0	7	22·0	29	44·81	170
May	70·0	26	29·0	8	49·25	193
June	77·0	22	31·0	5	55·76	228
July	84·0	10	49·0	6	65·01	323
August	79·0	23	33·0	31	62·33	324
September	74·0	11	32·0	25	54·03	222
October	66·0	6	24·0	22	46·04	118
November	61·0	5	17·0	22	37·09	85
December	50·0	25	— 6·0	14	21·59	65
1911.						
January	54·0	3	—15·0	17	18·12	113½
February	43·0	4	—19·0	13	12·49	170
March	52·0	28	—10·0	7	24 81	201¼
Total No. of hours sunshine.						2,212¾

PRECIPITATION.

Month.	Rain-fall.	Snow-fall.	Total Precipitation.
1910.	Inches.	Inches.	Inches.
April	2·92	....	2·92
May	2·90	....	2·90
June	3·72	....	3·72
July	3·13	....	3·13
August	1·55	....	1·55
September	3·14	....	3·14
October	4·14	....	4·14
November	4·18	....	4·18
December	1·85	10	2·85
1911.			
January	1·93	9	2·83
February	0·78	8	1·58
March	1·07	12	2·27

Ten inches of snow-fall is reckoned as equivalent to one inch of rain-fall.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

Superintendent.

Experimental Station, Cap Rouge, Que. Showing Piggery, Men's Houses, Horse Barn (far away), Paddocks for Colts, Cabins for Swine, etc.

EXPERIMENTAL STATION FOR CENTRAL QUEBEC.

REPORT OF G. A. LANGELIER, SUPERINTENDENT.

CAP ROUGE, QUEBEC, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my first report of the operations on the Experimental Station for Central Quebec.

DESCRIPTION OF NEW STATION.

Situation.—The property, formerly known as Stadacona Farm, which was taken over on January 1, 1911, by the Dominion Department of Agriculture, comprises lots 23, 26, 27, 30, 31, of the first concession of Demaure Seigniory, in the parish of St. Félix du Cap Rouge, County of Quebec, and is about nine miles from Quebec City, on the north shore of the St. Lawrence River.

Facilities of access.—The Transcontinental Railway touches the northeastern corner of the property. The Canadian Northern has its station a short distance from the southeastern part of the farm. The Quebec Electric Tramway is being built to Cap Rouge, about one-third of the road having been put into working order last autumn. The market boats come here now and then, and, with very little repairs to one of the many wharves, could bring excursions from the many large parishes situated along the St. Lawrence, both above and below Cap Rouge.

Area.—The farm, which is in a solid block, has an area of about 380 arpents*, of which 185 are in cultivation, 35 used for paddocks and buildings, 25 a steep side hill, 75 in brush, and 60 in forest. All the land is tillable, with the exception of 30 arpents.

Soil.—This is not very fertile and is underlaid at various depths with shale. It varies from a sandy to a heavy clayey loam and is fairly representative of that of a large number of farms in Central Quebec.

Drainage.—About 125 arpents have been drained, though in some places with tiles of too small a diameter. The other 60 arpents in cultivation, which are nearly level, need drainage.

Fences.—All the paddocks, and a few of the fields, are fenced with Page wire. The posts, all good cedar, are fifteen feet apart, and set in concrete where necessary. Four of the fields will have to be fenced this spring.

*The arpent is used both as a measurement of length and of surface. It is equivalent to 191 English linear feet and as a measurement of surface to .8375 of an acre, nearly.

Buildings—They comprise—

(*a*) The Superintendent's house, a brick structure. 52 x 35, with greenhouse, 20 x 14.

(*b*) The foreman's house, 28 x 37.

(*c*) The herdsman's house, 41 x 18.

(*d*) The boarding house, for the men, 30 x 30.

(*e*) The horse stable, 98 x 30, containing 14 box stalls, harness room, feed room.

(*f*) The cattle barn, 151 x 38, equipped with swinging stanchions, individual watering basins, litter carrier, silo.

(*g*) The piggery, 122 x 47, with stone boiler room, feed room, large shed for wintering brood sows.

(*h*) The poultry house, 25 x 33.

(*i*) The implement shed, 80 x 25.

(*j*) The store for tools, etc., 22 x 12.

(*k*) The blacksmith shop, 17 x 8.

(*l*) The ice house, 32 x 16.

(*m*) The Chatham 10,000 lbs. scales, 15 x 16.

Besides these, there is a building 15 x 15, over the well which furnishes water, by gravitation, to the piggery; a shed 12 x 12, in one of the paddocks, for calves; 2 shelters 15 x 15, for mares and colts; 6 cabins 8 x 8, for hogs.

All these buildings, except the Superintendent's house, are red with white trimmings, and present a very pleasing appearance. A few of those which were painted four or five years ago, as the horse barn, the piggery, the foreman's, also the herdsman's house, would be better for at least one, or perhaps even two, coats of paint.

The floors of the horse stable, cattle barn, piggery, hen house and ice house are of concrete, also the troughs in the piggery as well as the mangers and partitions of bull pens in the cattle barn.

Implements.—There is quite a complete set of these, including grain and turnip drills, potato and corn planters, single, two-furrow sulky, mould board and ditching ploughs, four horse cut away, four horse riding spring tooth, also two horse disc, spring tooth and levelling harrows, twelve-foot riding weeder, one row walking and two row riding cultivators, two mowers (one 7 feet), ordinary and side delivery rakes, hay loader, hay forks (2), grain and corn binders, potato digger, 30 bush. and 50 bush. manure spreaders, Vessot grinder, Smaller cutter with blower, Legaré wood saw, 12 horse-power portable Waterous steam engine, etc.

Accessories.—There is a heavy lorry, a two-horse Chatham wagon, a one-horse Bain wagon, three Scotch carts, a Surrey, express wagon, five sleighs, two carioles, three sets double harness, five sets single harness, U.S. cream separator, besides shovels, picks, axes, and a rather good set of wood and iron working tools.

WORK PLANNED AND IN PROGRESS.

AGRICULTURAL AND LIVE STOCK DIVISION.

Farm work.—Since January 1, the men have been busy cutting, hauling (2½ miles), and storing over two hundred large pieces of ice, keeping the roofs of the different buildings clear of snow, also about one mile of road in good shape. As there are no cattle on the Station this winter, we are getting about twenty-five single loads of manure from Quebec City every week and this has taken quite a lot of work.

Clearing land.—The wood was cut off from four to five acres of land, for fuel, and the place chosen was the nearest to the Transcontinental Railway, a part of the farm which should be cleared next summer.

Horses.—There are three teams of from 2,600 to 3,200 lbs. and a driver of about 1,000 lbs. One of the heavy mares being in foal, we shall require at least five more horses. If French Canadians are to be bred here, it would no doubt be an advantage to buy three or four registered mares this spring so as to begin operations immediately, this being a work which requires considerable time before much information can be gathered. If a couple of the mares were in foal, a good start could be made right away, and as there are two pure-bred stallions in the vicinity of Cap Rouge, the registered mares could be bred this spring, if desired.

Cattle.—There are no cattle on the place at present. As it has been decided to breed French Canadians here, I examined a few herds, under instructions from Ottawa, to pick out some good cows for foundation stock. The breeders will not sell their best at any price, but I hope to be able to gather about a dozen, and trust that you can send to this Station ten or twelve more from the Central Farm.

Swine.—There are six brood sows and a boar, all pure-bred Yorkshires. Four of the sows and the boar are extra good, the latter having won a championship at Toronto. It is expected that eight to ten choice gilts can be picked from this spring's litters, thus forming the nucleus of a select herd.

Sheep.—There are no sheep on the Station at present. However, it is expected that Shropshires will be bred and if a small flock be acquired this spring, we may commence work with this useful but neglected animal. The erection of a sheep barn can be delayed for a couple of years, as a part of the large shed, in the piggery, can be used for the present.

Poultry.—There are two pens of White Wyandottes. This is a very suitable variety, as it takes a strong fowl, with a rather small comb, to withstand the rigour of our climate, in the cold houses now advocated. Two small incubators and two brooders have been ordered, hence useful work can be started immediately in this division.

Bees.—It is important that apiculture be taken up here, as there are quite a number of persons interested in this branch, around Quebec City and in the adjacent counties. It might be well to have this part of the work started here in the coming spring, even if only on a small scale.

HORTICULTURAL DIVISION.

Flower and vegetable seeds were received a couple of weeks ago. The first have been started in flats and pots, in the greenhouse, while the other things will be sown later.

CEREAL DIVISION.

Most of the varieties of oats, barley, wheat, peas, Indian corn, carrots, turnips mangels, and sugar beets for the trial plots have been received. This work is of special importance here, as our climate precludes the growing of certain kinds of cereals which do very well in other provinces.

MISCELLANEOUS.

Meetings attended.—I attended the Seed Fair, in Quebec City, on January 19th and 20th last, and also the Poultry Show, at the same place, on February 1. Farmers were very much interested at both meetings, and there cannot be the least doubt that increased interest is now being taken in connection with the general advancement of agriculture in this province.

Visitors.—Though at a season when there is not much to be seen, there were quite a number of visitors during the three winter months. I noticed that the persons who came were eager to talk in an unbiassed way about the questions which interested them. Visits from such inquirers are always welcome. I promised some of these men that I would go to their places, next spring or summer, to discuss with them, right on the spot, the problems which they are trying to solve. This appears to be one of the best methods for our district; to bring right to the farmer's home the information he desires. Besides, one is able to give better help, when the exact circumstances and conditions are known and seen.

Correspondence.—From January 1 to March 31, there were received at this Station 390 letters, and 510 were sent.

Temperature.—It rained on January 1st and 2nd; on the 3rd, there was snow; on the 4th, a snow storm; on the 5th, mild in the morning and turning cold in the afternoon; on the 6th, cold and clear; 7th, a terrible north-eastern storm; 8th, milder with snow; 9th, another storm through the night but milder during the day; 10th, another storm, with cold weather; 11th, 12th, 13th, cold and clear; 14th, milder, snow during afternoon; 15th, 16th, 17th, 18th, clear and very cold, down to 23 below zero; 19th, milder, with snow at noon; 20th, cold and clear; 21st, mild, snow; 22nd, 23rd, 24th, 25th, very mild; 26th, mild, and snow; 27th, rain; 28th, snow storm; 29th, clear and cold; 30th, snow storm; 31st, clear and very cold.

February 1st, clear and very cold; 2nd, snow storm, cold; 3rd, clear, milder; 4th, storm from the north-east, mild; 5th, 6th, 7th, very cold; 8th, snow storm during afternoon; 9th, and 10th, mild; 11th, very cold; 12th, 13th, 14th, 15th, 16th, spring weather; 17th, heavy fall of snow; 18th, 19th, 20th, 21st, 22nd, clear and cold; 23rd, light fall of snow; 24th, mild; 25th, mild, snow in the morning; 26th, mild, rain at night; 27th, mild; 28th, clear and very cold.

March 1st, mild and cloudy; 2nd, mild and clear; 3rd, 4th, 5th, clear and very cold; 6th, mild; 7th, very cold; 8th, getting milder; 9th, 10th, 11th, very mild; 12th, snow in morning, light rain in afternoon; 13th, clear and cold; 14th, mild; 15th, mild, snow; 16th, snow storm; 17th, snow storm and very cold; 18th, clear and cold; 19th, milder; 20th, snow storm; 21st, very cold; 22nd, very heavy wind from north-west, milder; 23rd, regular mid-winter day; 24th, gale, accompanied by snow; 25th, clear, getting milder; 26th, very mild; 27th, rain; 28th, snow and gale as in January; 29th, very cold in the morning, milder in the afternoon; 30th, a regular mid-winter storm; 31st, fine in the morning, but turning cold in the afternoon, with a gale from the south-west.

This was a very hard winter; gales, snow storms, and cold being the rule nearly all through. The spring will no doubt be one of the latest in years, as, at the date of writing, the weather is still rigorous, and there is no sign of it getting milder. I do not remember seeing the latter part of March so cold as it was this year.

I have the honour to be, sir,

Your obedient servant,

GUS. LANGELIER,

Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF JAS. MURRAY, B.S.A., SUPERINTENDENT.

BRANDON, MAN., March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith the twenty-third annual report of the Experimental Farm for Manitoba at Brandon, giving the results of experiments undertaken during the past year.

The spring of 1910 in Manitoba opened up unusually early. The snow was all gone in March and work on the land had commenced in a few districts before the first of April. Seeding was quite general by April 2, and the weather up to that date was warm and bright. On the 13th, 14th and 15th, rain interrupted the work and on the 16th nineteen degrees of frost was recorded. This was the commencement of a series of vicissitudes which continued throughout the season and made a record for unfavourable conditions in many parts of Manitoba.

Sharp frosts which occurred at intervals during April and May did considerable damage to early-sown grain and garden crops. The injury was accentuated by persistent high winds which drifted the soil and left the tender plants exposed. An unusually light rainfall in May made the winds the more destructive. Considerable areas of wheat had to be resown as a result of the blowing and freezing.

The last frost of the spring was recorded on June 6, and after that date a period of extreme heat set in and continued with slight interruptions until the middle of August. During June, subsequent to the 10th of the month, the temperature was over 80 on eighteen days, over 90 on nine days and over 100 on four days. On June 20, 102.2 was recorded. To accentuate the effect of the extreme heat, practically no rain fell before the 30th, and a strong wind from the southwest prevailed. Crops of all kinds were practically ruined by these conditions in some districts, and in all parts they were very seriously injured.

July brought little change. The highest temperature of the season, 104.5 was recorded on the 14th. The daily maximum temperature for the month exceeded 70 every day and was over 80 on eighteen days. The rainfall during this period was only two inches and as most of this fell in light showers, its effect was scarcely noticeable.

Harvest was earlier than usual and the crop was quickly and cheaply secured. Good weather prevailed during the threshing season, the only interruption being showery weather in the first week of September.

The northern part of Manitoba had a considerably heavier precipitation than the southern portion and the temperatures, while higher than usual, were not so extreme as farther south. The crops of all kinds in the north were therefore a fairly good average, and in many instances were unusually good. In the extreme south on the other hand there were thousands of acres of crop not worth harvesting that were pastured off or cut with the mower for hay. Where the crops were harvested the yields were very light. This was true even on farms cultivated according to the most approved methods. In the central part of the province, crops varied greatly, but the

yield generally was considerably below the average. Those on stubble were almost invariably light, but on fallowed land they were usually much better, but not invariably so.

Altogether the season has not been a very auspicious one. Many farmers have had little return for their season's labours, and very few have had a full harvest.

The dry weather experienced in the summer continued during the fall, and the soil therefore contains very little moisture for next year's crop. The snowfall however has been unusually heavy, and this will help to furnish moisture for germination and early spring growth.

The first snow fell on November 13, but there was not sufficient for sleighing until the 27th, when there was a fall of fifteen inches. From that date until the end of December ideal winter weather prevailed. January was a month of heavy snowfall, extremely low temperatures and high winds.

CROPS ON THE EXPERIMENTAL FARM.

Work on the land started the first week in April, and wheat seeding was completed before the end of the month. The high winds and the frost during May retarded growth considerably, but did no serious damage to grain crops. The extreme heat of June and July was much more serious in its effects, the crops on stubble and on light land suffering most. The crops on summer-fallowed land withstood the drought best, but even these ripened too quickly, and did not yield as well as was expected from their appearance. Oats and peas suffered more from the heat than did the other grain crops.

Hay crops of all kinds were light, and old meadows on light land were scarcely worth cutting. Alfalfa produced about two tons per acre, which was more than twice as much as was cut from any other hay land.

Corn grew splendidly until about the middle of July, when the continued dry weather began to affect it. The crop was, however, far from a failure as it averaged nine tons per acre. The best yield was secured from four acres planted in hills forty inches apart each way. Turnips and mangels were greatly benefited by the rain early in September and yielded over twenty tons per acre.

The fruit crop was almost a complete failure as the trees and bushes were in full bloom when the May frosts were experienced. A light crop of currants and of strawberries was produced, but even these were injured by the drought and heat.

Garden vegetables were a good crop in spite of the untoward conditions. Thorough cultivation throughout the season was the secret of their success. Potatoes were a fair crop, and were secured in good condition.

The first frost was recorded on August 31. Grain crops were all secured before that date, but corn and tender vegetables were slightly injured.

EXPERIMENTS WITH WHEAT.

Spring Wheat—Test of Varieties.

Fourteen varieties were sown this year in uniform plots of one-twentieth of an acre. The soil was a heavy clay loam that had been fallow in 1909, and was in excellent condition at the time of sowing—April 26. Germination was uniformly good and the early growth satisfactory. The frequent frosts during May did no serious damage, as the grain recovered quickly. The growth of straw was not so rank as usual, and there was practically no lodging or rust.

Seed was used in the proportion of one and one-half bushels per acre.

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Ins.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	White Fife	Aug. 17	113	40	10	3½	2,740	45	40	63·4
2	Bishop	" 8	104	40	10	3	2,690	44	50	62
3	"Registered" Red Fife	" 17	113	43	9	3¼	2,680	44	40	63
4	"Regenerated" Red Fife	" 17	113	40	9	3¼	2,640	44	00	62
5	Marquis	" 10	106	38	10	3	2,560	42	40	63
6	Red Fife "H"	" 14	110	39	9	3¼	2,500	40	40	62
7	Preston	" 12	108	40	10	3¼	2,180	39	40	62·3
8	Riga	" 9	105	40	10	3	2,360	39	20	61
9	Chelsea	" 10	106	35	9	3¼	2,300	38	20	62
10	Early Red Fife	" 12	108	38	10	3	2,300	38	20	60
11	Pringle's Champlain	" 12	108	37	10	3¾	2,250	37	30	62
12	Stanley	" 12	108	39	9	3¼	2,180	36	20	60
13	Smith's Early Red Fife	" 10	106	38	10	3	2,160	36	10	61
14	Huron	" 13	109	39	10	3½	2,390	29	50	62

Five strains of Red Fife wheat are included in this table. The 'Registered' Red Fife was secured three years ago from a member of the Canadian Seed Growers' Association and has been grown here since then with very good results. The average yield for three years was 39 bushels 48 lbs. per acre, while the average of Red Fife 'H' for the same period was 40 bushels 46 lbs.

Early Red Fife is a strain of Red Fife selected for earliness by the Dominion Cerealist. It was grown on this Farm for the first time in 1909, when it yielded 34 bushels 17 lbs. per acre and ripened two days earlier than Red Fife 'H,' and yielded 2 bushels 10 lbs. less per acre. The only objection to this strain is that it is subject to rust. It has been much worse affected with rust both years it has been grown here than any other variety.

Smith's Early Red Fife is a selection of Red Fife made by Geo. A. Smith, Saskatoon. It ripened four days earlier than Red Fife 'H' but yielded 4 bushels 30 lbs. less per acre.

'Regenerated' Red Fife was secured from the Garton Pedigree Seed Co., Winnipeg.

Spring Wheat—Test of Varieties.

AVERAGE OF FIVE YEARS.

The following table gives the average yield and the average number of days maturing of six of the leading varieties of wheat.

Variety.	Average days Maturing.	Average Yield.	
		Bush.	Lbs.
Preston	111	42	58
White Fife	117	41	28
Red Fife	115	41	16
Huron	112	38	4
Stanley	112	37	58
Marquis (for three years)	107	45	3

Marquis has been tested for three years only and has given an average of 4[illegible] bushels 3 lbs. per acre for that period, as compared with 44 bushels 46 lbs. for Preston 42 bushels 46 lbs. for White Fife, and 40 bushels 45 lbs. for Red Fife, for the same period.

FIELD CROPS OF SPRING WHEAT.

Five varieties of spring wheat were sown in field lots last year. The yields are not comparable as neither the soil nor the cultivation was uniform for the different lots. The dry weather and extreme heat affected all the yields but the summer-fallowed land had a considerable advantage. Some of the corn stubble also gave excellent results.

The earlier-ripening varieties were mostly seriously affected by the heat as they were heading during the hottest weather, and were not greatly benefited by several showers which came late in July. The yield of Marquis wheat last year was disappointing as compared with the splendid results from this variety in 1909. The low yield last year was not due to any inherent peculiarity of the variety but to the exigencies of the season. Nine acres of Marquis were sown on land which had been broken out of brome grass in the spring of 1909, and backset in August. The soil was dry when it was backset and it was never properly moistened afterwards. The consequence was that the crop of wheat made a poor start, and as it had to combat a considerable growth of brome grass the returns were very poor. The Marquis on corn stubble yielded much less than Red Fife on land in similar condition but this was due to the Marquis being more advanced during the hottest weather.

The straw of all varieties was comparatively short and there was no lodged grain except in the White Fife. Early Red Fife was considerably rusted.

Spring Wheat—Field Lots.

AVERAGE AND TOTAL YIELDS.

Variety.	Soil preparation.	No. of Acres.	Yield per Acre.	Total Yield.	Weight per measured bushel after cleaning.
			Bush.	Bush.	Lbs.
White Fife	Summerfallow	7	34	238	61·7
Preston	"	4	32	128	58·5
Early Red Fife	"	4	27	108	60·5
Red Fife "H"	Corn stubble	6	34	204	62
"	Second crop after corn	6	20	120	62
"	Fall ploughed stubble	14	12	168	62
Marquis	Corn stubble	7	15	105	
"	Backsetting	9	10½	94½	
Total		...	....	1,165½	

A considerable quantity of this wheat was sent to the Central Experimental Farm, to be distributed in small samples throughout the country. The balance, except that required for seed, was sold in lots of from two to five bushels to farmers in Manitoba.

STANDARD AND COMMERCIAL GRADES OF WHEAT.

An experiment has now been under way for three years to determine the comparative value for seed of the various standard and commercial grades of wheat.

Samples of each of the grades were secured from the Chief Inspector of Grain at Winnipeg, and these were sown under uniform conditions of soil on plots of one twentieth of an acre, and the yields determined.

The results for the three years have been reduced to an average and are presented in the following table.

Grade.	Average Yield per Acre for Three Years.		Weight per Bushel.
	Bush.	Lbs.	Lbs.
No. 1 Hard	40	7	61
No. 1 Northern	40	..	61
No. 2 Northern	40	7	60¾
No. 3 Northern	38	40	60½
No. 4	38	17	6 ½
No. 5	37	31	60⅓
No. 6	33	54	60
Feed	30	21	60

It will be noted that there is an almost steady decrease in yield from No. 1 Hard to Feed. No. 2 Northern is the only exception to this rule. This grade is always sound and fairly plump and it may be graded down merely on account of colour.

The difference in yield per acre between No. 1 Hard and Feed is 9 bushels 46 lbs. and the difference in weight per bushel one pound. If there is so great a difference

in yield where the land is in excellent tilth it is only reasonable to assume that there would have been a greater difference with soil in poor condition.

WINTER WHEAT.

Winter wheat has been grown repeatedly on this Farm, but a successful crop was harvested for the first time last year.

Seed of Kharkov wheat was secured from the Experimental Farm at Lethbridge, Alberta, in 1909, and two sowings were made,—the first on August 26, and the second on October 4. The first came up soon after sowing and covered the ground well in the fall. There was no rain after the second sowing and practically none of it came up in the fall.

The plots were all covered with snow until the middle of March. As soon as the snow disappeared the late-sown plots came up and all of them made excellent growth. The plot sown with 90 lbs. of seed per acre on August 26, suffered considerably from winter-killing on account of a very heavy bank of snow.

The plots were one-fortieth of an acre.

WINTER WHEAT.

Rate of Seeding.	Sown Aug. 26th. Yield per Acre.		Sown Oct. 4th. Yield per Acre.		Weight per measured bushel after cleaning.
Lbs.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
90	17	12	47	32	62
60	42	17	47	15	62
30	53	22	44	20	62

A number of plots of Kharkov and one plot of Azima winter wheat were sown last fall and a good stand secured before winter set in. The plots are in the middle of a large field but have been well covered with snow throughout the winter.

SMUT PREVENTATIVES.

The stinking smut of wheat and the loose smut of oats and barley are more or less prevalent throughout Manitoba every year, but in 1910, there was very little loss from this cause. In view of the fact that these diseases can be controlled by any farmer by properly treating his grain before sowing, and as many continue to neglect this treatment each year or perform it in an inefficient manner, it has been considered advisable to repeat what was said in last year's report on this subject.

'During the past twenty years various chemicals have been tested to secure one for the prevention of smut in grain crops. Little difficulty has been experienced in controlling this disease in wheat or in oats, but no practicable method has yet been introduced that will entirely prevent it in barley. The formalin treatment has been found, after numerous trials, to be highly satisfactory. Formalin can now be secured almost anywhere; it is inexpensive, the solution is easily prepared, and its efficiency when properly applied is beyond doubt. One pound of formalin is sufficient to make thirty-two gallons of solution, and this quantity will easily cover forty bushels of

wheat, or about twenty-eight of oats. Dipping and sprinkling have given equally good results, but carelessness in either method of treatment is sure to bring disappointment.

'Bluestone has been found effective as a reagent for destroying smut, but its use has not been attended with quite as satisfactory results as formalin. A bluestone solution of the proper strength is prepared by dissolving one pound of bluestone in six gallons of soft water. As with the formalin solution, it makes no difference how this solution is applied so long as every kernel of grain is thoroughly moistened.

'Other treatments that have been on trial, as preventatives of smut, include those with sulphide of potassium, sulphate of iron, agricultural bluestone, massel powder, anti-fungi, salt, and hot water. None of these has proven to be nearly as effectual as either formalin or bluestone. The hot water treatment and the sulphide of potassium both effectively prevented the disease, but the methods of application are too tedious to permit of either treatment coming into general use. Agricultural bluestone and anti-fungi are both mixtures of copper sulphate and iron sulphate, and their effectiveness is dependent upon the proportion of sulphate of copper that they contain, sulphate of iron being of little value as a fungicide.'

The loose smut of wheat is a distinct disease from the stinking smut and cannot be controlled by formalin or bluestone. The only sure method for it yet discovered is what is known as the 'hot water treatment.' For this treatment the grain is placed in a bag and immersed in water at about 115° F. After it is well warmed through it is placed in water which is kept at a temperature between 130 degrees and 135 degrees F. The grain should be stirred occasionally and allowed to remain in the water for fifteen minutes. Afterwards it should be spread on a clean floor to dry.

While this treatment is effective in killing the smut spores it is not adapted to being used in general farm practice as it is very slow and requires to be very carefully performed.

TREATMENT OF SMUT, 1910.

Five methods of treatment of stinking smut of wheat were tried during the past season. The bluestone and formalin solutions were prepared as outlined above, and Cooper's dressing, which is put up by Wm. Cooper & Nephews, was prepared according to directions on the package. A fairly smutty sample of Huron wheat was used. Before the grain was harvested a careful count was made of the number of good heads and of smutted heads in nine feet of row, three feet in each of three different parts of the plot.

The plots were of one-twentieth of an acre.

Treatment.	No. of Heads in Nine Feet of Row.		Yield per Acre.	
	Good.	Smutted.	Bush.	Lbs.
Formalin (sprinkled)	182	0	42	30
Bluestone (Copper Sulphate), sprinkled	185	0	42	..
" " " dipped	187	0	41	40
Formalin (dipped)	169	0	40	50
Cooper's Dressing	186	3	40	10
Not treated	170	41	39	..

EXPERIMENTS WITH OATS.

The dry, hot season was very unfavourable for the oat crop and the yields were quite disappointing. Land which would have yielded eighty bushels per acre in an ordinary year, produced only thirty-five, and the best crops yielded only sixty-five bushels per acre. All the crops made good progress until the middle of June, but after that date they suffered for want of rain.

OATS—TEST OF VARIETIES.

Twenty-three varieties of oats were grown in uniform plots of one-twentieth of an acre. The land was a heavy clay loam that had been summer-fallowed in 1909.

The seed was sown May 14, at the rate of two bushels per acre. The crop grew splendidly in spite of the heat and drought until the middle of July, but ripened too quickly to give a high yield.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.			Weight per measured bushel after cleaning.
					Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Banner	Aug.	17	95	40	10	8	3,030	90	20	37·6
2	Registered Banner	"	18	96	41	10	8	3,050	89	24	37
3	Irish Victor	"	17	95	38	10	8½	3,030	89	4	37
4	Golden Beauty	"	21	99	38	9	7½	3,030	89	4	38
5	Improved American	"	18	96	40	10	8	2,980	87	22	39
6	Abundance	"	18	96	38	10	8	2,940	86	16	37·3
7	Siberian	"	17	95	39	10	8	2,870	84	14	38
8	Danish Island	"	18	96	40	10	8	2,860	84	4	38
9	White Giant	"	21	99	40	10	8	2,840	83	18	37·5
10	Swedish Select	"	17	95	38	10	7	2,790	82	2	39
11	Thousand Dollar	"	17	95	38	10	7½	2,780	81	26	39·2
12	Pioneer	"	22	100	42	10	8	2,770	81	16	37·5
13	Virginia White	"	17	95	35	10	7	2,770	81	16	37·6
14	Gold Rain	"	16	94	39	10	7½	2,750	80	30	42·5
15	'Regenerated' Abundance	"	17	95	37	10	7½	2,740	80	20	40
16	Twentieth Century	"	17	95	38	10	8	2,710	79	24	39·2
17	Victory	"	18	96	39	10	7	2,700	79	14	42
18	Lincoln	"	19	97	39	10	8	2,650	77	32	39
19	Wide Awake	"	19	97	40	10	8	2,590	76	6	39·5
20	Improved Ligowo	"	14	92	35	10	6½	2,510	73	28	39·5
21	Alsasman	"	16	94	36	10	7½	2,430	71	16	40·5
22	Daubeney	"	10	88	31	10	6	2,360	69	14	34·6
23	Orloff	"	9	87	29	10	6	2,160	63	18	34

Pioneer is the only black variety in the above table.

Golden Beauty, Gold Rain, and Orloff are yellow, while Daubeney is mixed yellow and white.

Gold Rain and Victory, which were grown here for the first time, are Swedish varieties produced by Dr. Neilson, Svälof, Sweden.

Daubeney and Orloff are very early varieties suited only to special conditions.

OATS—Test of Varieties.

AVERAGE YIELD FOR FIVE YEARS.

The following table gives the average yield of a number of the leading varieties of oats for the past five years.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bush.	Lbs.
Banner	100	111	16
Improved American	100	111	13
Danish Island	101	110	29
White Giant	101	107	9
Golden Beauty	103	103	26
Siberian	100	102	11
Abundance	101	99	29
Thousand Dollar	99	98	11

FIELD CROPS OF OATS.

The yield of oats varied greatly on different fields according to the moisture that was available for the crop. Summer-fallowed land gave the best returns, but this was much below a normal yield on such land.

Variety.	Soil Preparation.	No. of Acres.	Yield per Acre.	Total Yield.	Weight per Measured bushel after cleaning.
			Bush.	Bush.	Lbs.
Banner	Summer-fallow	6	48	288	39
Banner	Fall ploughed stubble	6	32	192	39
Banner	Fall ploughed stubble	36	30	1,080	39
Banner	Spring ploughed stubble	4	35	140	39
Thousand Dollar	Summer-fallow	6	66	396	40·3
Daubeney	Summer-fallow	2	44	88	38·5
Total				2,184	

EXPERIMENTS WITH BARLEY.

Ten varieties of six-row and ten varieties of two-row barley were sown on May 26 on uniform plots of one-twentieth of an acre. The land was heavy clay loam that had been summer-fallowed in 1909. Two bushels of seed was sown per acre.

Barley, Six-Row.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Yale	Aug. 16	82	32	10	2½	2,620	54	28	49·5
2	Odessa	" 17	83	30	8	2½	2,410	50	10	49
3	O.A.C. No. 21	" 14	80	32	10	2½	2,410	50	10	47
4	Mansfield	" 15	81	30	10	2¼	2,250	46	42	48
5	Mensury	" 16	82	32	10	2½	2,140	44	28	47
6	Oderbruch	" 15	81	30	10	2½	2,050	42	34	52·2
7	Nugent	" 18	84	30	10	2¾	2,010	41	42	51
8	Trooper	" 18	84	29	10	2½	2,010	41	42	50·8
9	Albert	" 16	82	28	10	2¾	1,890	39	18	52
10	Claude	" 17	83	29	10	2½	1,880	39	8	50

Barley, Two-Row.—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Hannchen	Aug. 19	85	29	9	3	3,108	64	36	52
2	Danish Chevalier	" 21	87	30	5	3	2,950	61	22	51·2
3	Canadian Thorpe	" 18	84	36	9	2¾	2,940	61	12	52·5
4	Swedish Chevalier	" 19	85	33	7	3½	2,890	60	10	52
5	Standwell	" 18	84	33	7	2½	2,530	52	34	52
6	Invincible	" 21	87	34	9	3	2,430	50	30	51
7	Jarvis	" 17	83	37	9	3¼	2,516	50	20	51·7
8	Clifford	" 18	84	31	9	3	2,350	48	46	51
9	Beaver	" 17	83	32	10	3¼	2,070	43	6	52
10	French Chevalier	" 19	85	31	10	3	1,990	41	22	51·6

O.A.C. No. 21 is a selection of Mandscheuri made at the Ontario Agricultural College, Guelph, Ont. It has been grown here for three years and seems to be a good yielder and to have a particularly stiff straw.

Hannchen was grown here for the first time in 1910. This was obtained from Dr. Neilson, Svälof, Sweden.

Barley—Test of Varieties.

Average Yield for Five Years.

The following table gives the average yield and the average number of days maturing for several of the leading varieties of barley for the past five years.

Six-Row Barley.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bus.	Lbs.
)dessa	85	61	30
Yale	85	60	28
Mensury	85	59	46
Mansfield	85	58	4
).A.C. No. 21 (three years)	84	60	..

Two-Row Barley.

Variety.	Average Days Maturing.	Average Yield per Acre.	
		Bus.	Lbs.
wedish Chevalier	90	59	10
'anadian Thorpe	88	58	14
arvis	88	57	30
tandwell	84	57	26

Field Crops of Barley, 1910.

Variety.	Soil Preparation.	No. of Acres.	Average Yield.	Total Yield.	Weight per Measured Bushel after Cleaning.
			Bus.	Bus.	Lbs.
lensury	Wheat stubble, spring ploughed	8	35	280	47
"	Pea land, surface cultivated	8	35	280	47
"	Oat stubble, fall ploughed	8	11	88	47
"	Summerfallow	5	41	205	47
"	Barley stubble, spring ploughed	2	31	62	47
dessa	Barley stubble, fall ploughed	9	34	306	47
.A.C. No. 21	Root land, fall ploughed	1	34	34	50
	Total			1,255	

EXPERIMENTS WITH PEAS.

The pea crop is not grown as extensively in Manitoba as its value warrants. It : probably the most valuable annual leguminous crop that we can grow. Like the ther legumes, it is able to utilize the nitrogen of the air in its growth and stores onsiderable of it in its roots. This goes to enrich the land when the crop is removed. is a rank-growing crop and might be used to advantage in this province as a green rop to plough down to increase the humus of the soil, as clover does not attain sufficient ze in one season here to make it valuable for that purpose. Peas will produce an

immense growth in from eight to ten weeks and analyses prove that the growth contains about 130 lbs. of nitrogen per acre. A considerable proportion of this is undoubtedly from the atmosphere.

The pea crop is also valuable when ripened. The grain is very rich in protein and when mixed with other grains, is a very valuable feed for milch cows and hogs The straw, if cut before thoroughly ripe, is excellent for sheep feed.

When grown for feed, peas are best sown mixed with oats at the rate of three bushels per acre, equal parts by weight. They may then be cut with the binder. This mixture also makes an excellent soiling crop for milch cows for the early part of the summer.

When grown alone, they are best harvested with the pea harvester attachment to the mower.

Peas—Test of Varieties.

Thirteen varieties of peas were grown on uniform plots of one-twentieth of an acre. The land was a clay loam that had been summer-fallowed in 1909. The seed was sown April 27, at the rate of from 2 to 3 bushels per acre according to the size of the pea. Germination was uniformly good but when the peas were a few inches high a succession of strong winds did considerable damage to them, particularly at the ends of the plots. This checked the growth for some time and no doubt affected the yield.

Peas—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per Measured Bushel after Cleaning.
					Inches.	Inches.	Lbs.	Bus.	Lbs.	Lbs.
1	Mackay	Medium	Aug. 27	118	36	2	2,390	39	50	63
2	Paragon	"	" 30	120	34	2¼	2,370	39	30	63
3	Prince	"	" 30	121	32	2¼	2,190	36	30	62
4	Picton	"	" 30	120	38	2	2,080	34	40	64
5	Gregory	"	" 29	119	34	2	1,980	33	00	63
6	English Grey	"	Sept. 2	123	53	2¼	1,870	31	10	61
7	Golden Vine	Small	" 2	123	34	2	1,720	28	40	64
8	Black-Eye Marrowfat	Large	" 8	129	50	2½	1,590	26	30	62.5
9	Prussian Blue	Medium	Aug. 28	118	34	2½	1,560	26	00	63.5
10	Daniel O'Rourke	Small	Sept. 1	112	32	2	1,500	25	00	63.5
11	Arthur	Medium	Aug. 26	121	33	2¼	1,500	25	00	64
12	Chancellor	Small	" 27	117	30	2¼	1,350	22	30	64.5
13	White Marrowfat	Large	Sept. 7	118	60	2½	1,020	17	00	63.5

MIXTURES OF GRAIN FOR GRAIN PRODUCTION.

In growing grain for feed, the object should be to produce as much as possible per acre. An experiment was started in 1909 to secure some information on the relative values of various mixtures of the coarse grains for the production of feed as compared with oats, barley and peas sown alone.

The varieties used were Daubeney oats and Mensury barley for the oat and barley mixtures; Banner oats and Arthur peas and Mensury barley for the other mixtures.

The following table gives the average yield per acre for 1909 and 1910:—

Mixtures of Grain.	Yield per Acre.
	Lbs.
Oats, 2 bush., Peas, ½ bush	3,030
Oats 1½ bush., Peas, ½ bush	2,900
Oats, 1 bush., Barley, 1 bush	2,720
Oats, 1½ bush., Barley, ½ bush	2,710
Oats, 1 bush., Barley, 1 bush., Peas, 1 bush	2,655
Oats, ½ bush., Barley 1½ bush	2,645
Oats, 1 bush., Barley, 1½ bush	2,595
Oats, 1½ bush., Barley, 1½ bush.	2,530
Banner oats, 2 bush	3,420
Mensury barley, 2 bush	2,251
Daubeney oats, 2 bush	2,360
Arthur peas, 3 bush	1,872
For one year	
Oats, 1½ bush., Peas, ½ bush	2,780
Oats, ½ bush., Barley, 1 bush	2,400
Oats, ½ bush., Peas, 1 bush	2,220
Oats, ½ bush., Peas, 2 bush	2,130
Oats, ½ bush., Barley, 2 bush	2,120

EXPERIMENTS WITH FIELD ROOTS.

Field roots are not grown extensively in Manitoba, but the acreage is gradually increasing from year to year. The long winter makes the use of such feed as roots almost essential, if stock are to be kept in thrifty growing condition. For pigs, young cattle and milch cows, they are particularly desirable.

Such large crops of roots cannot be expected in Manitoba as in districts of greater rainfall, but when suitable soil conditions are provided and thorough cultivation given, a good crop is assured every year. Turnips will probably continue to be grown most largely as they are less easily injured by frost in spring or fall than mangels or sugar beets. When saved without frost, mangels and sugar beets will keep better than turnips and are more relished by cattle and hogs.

As roots thrive best in cool moist seasons, a heavy yield could not be expected after such a hot, dry summer as prevailed here last year. Turnips were a fairly good crop as they were materially benefited by rain in the first week of September.

Two sowings were made in 1910, the first sowing giving the best results as usual. Sowing on the flat was practised on account of the ground retaining the moisture better than when drilled.

EXPERIMENTS WITH TURNIPS.

Nine varieties of turnips were sown on clay loam that had been in potatoes the previous year. The first sowing was made May 10, and the second sowing May 21, and both were pulled October 17. The rows were thirty inches apart and the young plants were thinned out to about nine inches apart in the row. The yield per acre in each case was estimated from the product of two rows, each 66 feet long.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Magnum Bonum	May 10	May 21	Oct. 17	Oct. 17	17	1,904	598	24	13	400	440	..
2	Perfection Swede	" 10	" 21	" 17	" 17	17	1,614	594	00	12	288	404	48
3	Hartley's Bronze	" 10	" 21	" 17	" 17	17	1,376	589	36	17	848	580	48
4	Jumbo	" 10	" 21	" 17	" 17	17	1,112	585	12	12	1,872	431	12
5	Good Luck	" 10	" 21	" 17	" 17	17	320	572	..	22	88	734	48
6	Carter's Elephant	" 10	" 21	" 17	" 17	16	1,528	570	28	13	136	435	36
7	Hall's Westbury	" 10	" 21	" 17	" 17	15	1,944	532	24	19	280	638	00
8	Halewood's Bronze Top	" 10	" 21	" 17	" 17	13	928	448	48	16	528	558	48
9	Mammoth Clyde	" 10	" 21	" 17	" 17	9	480	308	..	13	1,984	466	24

EXPERIMENTS WITH MANGELS.

Eight varieties of mangels were sown under uniform conditions. The land was a clay loam that had grown potatoes in 1909.

The first sowing was made May 21, and the second June 3. Both lots were pulled October 10. The rows were thirty inches apart and the young plants were thinned out to about nine inches apart in the row. The yield per acre in each case was estimated from the product of two rows each 66 feet long.

MANGELS—Test of Varieties.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Selected Yellow Globe	May 21	June 3	Oct. 10	Oct. 17	21	240	704	..	15	624	510	24
2	Prize Mammoth Long Red	" 21	" 3	" 10	" 17	19	1,6..	660	..	15	360	506	..
3	Perfection Mammoth Long Red	" 21	" 3	" 10	" 17	18	1,488	624	48	13	1,984	466	24
4	Half Sugar White	" 21	" 3	" 10	" 17	17	1,904	598	24	16	472	541	12
5	Gate Post	" 21	" 3	" 10	" 17	14	1,832	497	12	15	888	514	48
6	Giant Yellow Globe	" 21	" 3	" 10	" 17	14	1,040	484	..	10	1,912	365	12
7	Yellow Intermediate	" 21	" 3	" 10	" 17	13	1,192	453	12	18	960	616	..
8	Giant Yellow Intermediate	" 21	" 3	" 10	" 17	9	480	308	..	10	1,912	365	12

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were grown under uniform conditions, on land which had produced potatoes in 1909. The rows were thirty inches apart and the plants were thinned out to about 6 inches apart in the row. The first sowing was made May 21 and the second June 3. Both lots were pulled October 10.

Samples of each variety were forwarded to Mr. Frank Shutt, Dominion Chemist, for analysis, and the results are given in the table.

The yield per acre in each case was estimated from the product of two rows each 66 feet long.

Sugar Beets—Test of Varieties.

Number.	Variety.	Yield per Acre. 1st Sowing.		Yield per Acre. 2nd Sowing.		Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		Tons.	Lbs.	Tons.	Lbs.	p.c.	p.c.	
1	Klein Wanzleben.	13	1,192	10	328	18·87	22·09	85·4
2	Vilmorin's Improved........	12	552	9	1,536	19·23	21·89	87·8
3	French Very Rich..........	8	1,424	6	1,200	17·11	22·17	77·1

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown under uniform conditions on land which had produced potatoes in 1909. The carrots were sown in rows 18 inches apart, and the young plants were thinned out to about four inches apart in the row.

The first sowing was made May 10 and the second May 21. Both lots were pulled October 25. The yield per acre in each case was estimated from the product of two rows each 66 feet long. The dry season very seriously affected the yield.

Carrots—Test of Varieties.

Number.	Name of Variety.	1st Plot Sown.		2nd Plot Sown.		1st Plot Pulled.		2nd Plot Pulled.		Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
										Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White........	May	10	May	21	Oct.	25	Oct.	25	5	1,000	183	20	5	1,440	190	40
2	Mammoth White Intermediate	"	10	"	21	"	25	"	25	5	120	168	40	5	1,880	198	..
3	Ontario Champion........	"	10	"	21	"	25	"	25	4	1,680	161	20	2	1,280	85	..
4	White Belgian	"	10	"	21	"	25	"	25	4	800	146	40	3	1,480	124	40
5	Half Long Chantenay	"	10	"	21	"	25	"	25	4	800	146	40	3	1,920	132	..

HOME GROWN ROOT SEED.

In the fall of 1908 a number of roots of several good varieties of turnips and mangels were saved and planted out the following spring. Most of the roots produced seed. which ripened and was harvested before severe frost in the fall.

Last spring a row of each variety of seed was sown under the same conditions as the varieties grown from commercial seed; the balance of the seed was used for sowing field lots.

The following table gives the yield per acre from the home grown seed and from commercial seed of the same variety.

HOME GROWN AND COMMERCIAL ROOT SEED.

Variety.	Commercial Seed.		Home Grown Seed.	
	Tons.	Lbs.	Tons.	Lbs.
Good Luck Turnip	17	320	16	1,000
Hall's Westbury Turnip	15	928	15	96
Yellow Intermediate Mangel	13	1,192	14	512
Half Sugar White Mangel	17	1,904	27	1,176

The difference in yield is very little, except with one variety.

A notable feature of the home grown mangel seed was that it germinated quicker and more uniformly than the commercial, the young plants appearing three or four days earlier. The commercial seed was sown thickly enough to give a good stand, so that the high vitality of the home-grown seed is not indicated in the yield per acre.

In the seed year, two varieties of mangels were planted side by side and therefore cross-fertilized. This was evident when the roots were produced this year, the distinctive colours of the two varieties being considerably mixed in each lot. A selection of roots of Half Sugar White was made in the fall of 1910 from the product of the home-grown seed. Roots uniform in shape and of good size were chosen, and these will be planted out next spring. In a favourable season mangels produce seed very abundantly and a dozen roots will easily produce sufficient seed to sow an acre.

EXPERIMENTS WITH POTATOES.

Potatoes were rather a light crop last year but they were of good quality and there was no loss from rot or other causes.

The variety tests were conducted on land which had produced a crop of turnips in 1909, and had been manured and ploughed in the fall after the roots were harvested. They were given thorough cultivation throughout the summer and were hilled up slightly about the first of August.

The potato beetles were particularly numerous but were controlled by spraying with Paris green.

Twenty-three varieties were grown. They were planted May 23, in rows three feet apart, the sets being placed about a foot apart in a row. They were dug October 5.

The yield per acre in each case was estimated from the product of one row 66 feet long.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Average Size.	Total yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Manitoba Wonder	Medium	436	20	381	20	55	..	Pink.
2	Morgan Seedling	"	418	..	381	20	36	40	Light pink.
3	Empire State	Large	410	50	385	10	25	40	White.
4	Carman No. 1	"	407	40	377	40	29	20	White.
5	Money Maker	"	405	10	374	..	31	10	Long, white.
6	Late Puritan	"	377	40	352	..	25	40	Long, white.
7	American Wonder	Medium	370	20	348	20	22	..	Long, white.
8	Gold Coin	Large	353	50	339	10	14	40	White.
9	Reeves' Rose	Medium	348	20	330	..	18	20	Pink.
10	Everett	Small	341	..	304	20	36	40	Light pink.
11	Early White Prize	"	341	..	304	20	36	40	White.
12	Ashleaf Kidney	Large	339	10	326	20	12	50	Round, white.
13	Early Ohio	"	337	20	315	20	22	..	Pink.
14	Peacock's Surprise	Medium	289	40	271	20	18	20	Long, russet.
15	Irish Cobbler	Small	289	40	264	..	25	40	Round, white.
16	Hamilton's Early	"	278	40	249	20	29	20	Round, white.
17	Rochester Rose	"	275	..	245	40	29	20	Round, pink.
18	Dreer's Standard	Medium	264	40	245	40	18	20	Round, white.
19	Vick's Extra Early	Small	212	40	179	40	33	..	Round, white.
20	Woodbury's White Rose	"	205	20	190	40	14	40	Long, white.
21	Factor	"	183	20	157	40	25	40	Round, white.
22	Hard to Beat	"	157	40	124	40	33	..	Flat, white.
23	Dalmeney Beauty	"	135	40	113	14	22	..	Yellowish-white

CROP ROTATIONS IN MANITOBA.

Since the settlement of Manitoba thirty years ago it has been known as a grain producing province. The virgin condition of the prairie permitted the land to be brought under cultivation at little expense, and the acreage in cereals increased rapidly. A soil more than usually rich in plant food and a climate particularly suitable enabled more grain growing to be continued for many years at a profit.

An abundance of hay in sloughs and on unoccupied land rendered unnecessary the cultivation of hay crops, and, as little stock was kept, pasture was easily secured. The bulk of the land held by every farmer was therefore available for grain growing.

When the soil was new, manure was not required. Later, when it should have had a good effect, a too liberal application often had a deleterious instead of a beneficial result on account of the soil being dried out. The use of manure was, therefore, in many cases abandoned.

The control of weeds was, from the first, one of the problems which annually pressed for solution. The summer-fallow was most generally used for this purpose, and in the case of most weeds with good results. Good crops, comparatively free from weeds, usually succeeded the fallow for a few years. When weeds again became numerous the same remedy was applied.

This system of farming has in large measure been continued up to the present, although of late years there has been a tendency on the part of some farmers to adopt other systems. For this change there are several causes. The continual removal of grain crops from the land with nothing added to counteract the effect, has resulted in the soil being gradually impoverished and less able to produce abundant crops. The continued cultivation and the exposure of the soil to the sun and air by summer-fallowing has had the effect of working the fibre out of the soil and depleting the humus, thus making it much more liable to blow, more difficult to work, and less con-

genial to growing plants. The incursions of weeds of various kinds not easily destroyed by summer-fallowing have also had the effect of directing attention to a more diversified system of farming.

The effect of continuous grain growing with little or nothing being returned to the soil must become more marked from year to year. The length of time that it can be continued profitably depends on various factors, chief among which are the nature of the soil, its virgin store of plant food and the thoroughness of cultivation from year to year.

A rich clay soil is capable of producing, when handled to best advantage, many more crops than a light soil, but the most productive must ultimately fail to be profitable when no return is made to it to counterbalance the constant drain of fertility through the removal of grain crops.

A solution of the problem lies in the adoption of a system of crop rotation, that will gradually year by year make the land more productive and at the same time enable the margin of profit to be increased.

A crop rotation is simply an arrangement of the various farm crops which repeats itself each time the course is run. A rotation may be of any duration, two, three, four, five, up to ten years or more. Most rotations however are of less than ten years.

The kind of rotation that should be adopted on any given farm will depend on the class of farming followed, and the nature of the soil. In arranging a rotation a knowledge of the food requirements of the various kinds of crops is essential in order that they may succeed one another to the best advantage. For example such crops as corn, roots and hay require an abundance of nitrates for building stem and leaf and can therefore make excellent use of manure, whereas cereal crops can do with less nitrates and may follow a corn or root crop. The planning of the rotation resolves itself into arranging the three classes of crops, cereals, grass and hay crops, and cultivated crops to the best advantage for the system of farming followed, and to suit the particular farm.

Since cereal farming is bound to be the chief branch of farming in Manitoba for many years yet, it follows that rotations suitable for adoption here must provide for a considerable acreage in grains. The proportion of pasture, hay and cultivated crops will depend upon the amount of stock to be provided for. On some farms there is sufficient rough land for pasture, and on such a farm no provision requires to be made in the regular rotation for a pasture crop.

Just what rotations are suitable for conditions in this province is as yet an unsettled question, but one which is deserving of close study. In order to get some definite information a start was made some years ago in putting a number of rotations into practice on parts of this Farm and now most of the cultivated land has been put under one or other of a number of test rotations. An outline follows of each of the rotations on trial—

ROTATION A.

Six years, wheat, oats, hay, pasture, corn and roots. An area of 38 acres divided into six fields is devoted to this rotation.

1st year.—*Wheat* sown on corn stubble that has been harrowed thoroughly, land fall ploughed after harvest.

2nd year.—*Wheat,* land ploughed in the fall if in good condition or left until spring.

3rd year.—*Oats,* sown with 8 lbs. Red clover and 4 lbs. Timothy per acre.

4th year.—*Clover hay.*

5th year.—*Pasture,* manured in summer and ploughed as soon after July 1 as possible, worked at intervals during the summer and fall to destroy weeds and conserve moisture.

6th year.—*Corn and Roots* cultivated at intervals throughout the summer to stimulate growth and destroy weeds.

On a half-section farm, 300 acres cultivated, this rotation would give: 100 acres wheat, 50 acres oats, 50 acres hay, 50 acres pasture, 50 acres corn and roots.

ROTATION B.

Six years, wheat, wheat, oats, hay, pasture, peas. An area of 27 acres is devoted to this rotation.

1st year.—*Wheat,* sown on land that was in peas the year previous, prepared by thorough surface cultivation, land fall ploughed after harvest.

2nd year.—*Wheat,* manure applied in the spring after the crop is sown. Land fall ploughed or spring ploughed.

3rd year.—*Oats,* sown with Rye grass 8 lbs. and Red clover 6 lbs. per acre.

5th year.—*Pasture,* ploughed during the summer and cultivated at intervals.

6th year.—*Peas.*

This rotation would give the same acreage of wheat, oats, hay and pasture as Rotation A, but 50 acres of peas instead of that area of corn and roots.

ROTATION F.

Six years.—Flax, wheat, oats, hay, pasture, peas. An area of 27 acres is devoted to this rotation.

This rotation is the same as Rotation B, except that flax is grown the first year instead of wheat.

ROTATION C.

Five years.—Wheat, wheat, corn, oats, clover. An area of 40 acres is devoted to this rotation.

1st year.—*Wheat,* sown on land that was in clover the previous year, land ploughed in the fall after harvest.

2nd year.—*Wheat,* land manured after harvest and ploughed.

3rd year.—*Corn and Roots,* sown after the land has been well cultivated a number of times, cultivated at intervals through the summer to stimulate growth and destroy weeds.

4th year.—*Oats,* sown on corn stubble after it has been well harrowed. Red clover 8 lbs. and Timothy 3 lbs. and Rye grass 4 lbs. sown with the oats.

5th year.—*Hay,* ploughed as soon as possible after haying and worked at intervals during summer and fall in preparation for wheat.

In a half section farm, 300 acres of which was cultivated, this rotation would give 120 acres of wheat, 60 acres oats, 60 acres hay, 60 acres corn and roots.

This rotation would only be suitable for a farm which had other land available for pasture. If thought advisable part of the land the third year could be in peas.

ROTATION L.

Five years.—Oats, oats, barley, hay, hay. An area of 15 acres is devoted to this rotation.

This rotation is arranged for land that on account of water lying on it in the spring cannot be sown in wheat. It might also be suited to districts where wheat cannot be grown satisfactorily. The mixture for the hay in this rotation is Timothy [illegible] lbs., Alsike 3 lbs., Red clover 3 lbs. per acre.

ROTATION N.

Four years.—Wheat, wheat, oats, fallow.

ROTATION M.

Four years.—(With manure), wheat, wheat, oats, fallow. An area of 8 acres is devoted to these two rotations.

Rotations N and M differ from one another only in that in M manure is used on the second crop of wheat and in N no manure is used.

The system of cropping indicated in N, is similar to that followed by many farmers in Manitoba, and this is to be tested with the others to compare the financial returns and the effect on the condition and fertility of the soil.

Rotation M is to determine the advantage of using manure when the crops grown are as indicated.

ROTATION S.

Forty acres for sheep land.

Eight years.—Roots and peas, wheat or oats, hay, hay, pasture, pasture. pasture, green crop, rape, etc.

In this rotation, manure is to be applied twice in eight years, as a top dressing after hay in the third year, and for the green crop in the eighth year.

The land to be under this rotation is forty acres of light land that is to be used for sheep. A fence designed to be coyote-proof, encloses the area, and portable fences will be used for subdividing where necessary.

RELATIVE VALUE OF ROTATIONS.

The value of a rotation can be determined definitely only after it has been in actual operation for a number of years. It is only then that its effect on the fertility, the condition of the soil, and the cost of production of the various crops can be accurately ascertained. It is essential to know the cost of production under each system of rotation as it is only in this way that the value of the products can be compared.

In addition to the value of the products harvested under a definite rotation and the cost of producing them in labour, rent and manure, there is to be considered the effect of the rotation on the soil fertility and condition as influenced by the amount of humus and plant food consumed and left for subsequent crops. This cannot accurately be determined on large areas as even the most uniform soils vary greatly in composition over an area of several acres. It has therefore been considered advisable to confine that part of the rotation work which pertains to their effect on the composition of the soil to a small area of uniform virgin soil. This was broken and backset in 1910. Half an acre is to be devoted to each rotation. This will be cropped and worked the same as the regular rotation except that only one crop of the rotation will appear each year instead of all the crops as in the regular field work. For example Plot A representing Rotation A and consisting of half an acre will be cropped as follows: 1911, wheat, 1912, wheat, 1913, oats, 1914, hay, 1915, pasture, 1916, corn and roots.

In addition to there being a plot for each of the rotations above outlined Plot E is added. This is to be cropped with grain continuously.

Samples of soil for analysis were secured in October, 1910, from each of the plots by Mr. Frank T. Shutt, Dominion Chemist. Two samples were taken from each plot, one representing the top six inches of soil and one representing the soil from six inches to twelve inches below the surface. Samples from the same places will be taken at intervals of a few years for comparison with the original samples to determine the effect of the various systems of cropping.

EXPERIMENTS WITH ALFALFA.

I am pleased to be able to report another year's success with alfalfa. There was no winter or spring killing experienced and in spite of an unusually hot, dry summer two fairly good cuttings of hay were secured. The yield of hay was much lighter than usual on account of the drought but was more than twice as heavy as that of any other hay crop on the Farm. This is another evidence of the value of alfalfa for Manitoba conditions, as grass hay crops are quite frequently short on account of little rain.

In view of the increasing interest in the growth of alfalfa in Manitoba and of the number of farmers who are anxious to grow the crop, I make no apology for repeating some of what was said in last year's report regarding the growing of alfalfa under our conditions.

Alfalfa has been on trial at the Experimental Farm for upwards of fifteen years and has been grown to a limited extent in other parts of Manitoba. During these trials, failures have been met with and difficulties encountered, but of late years very good success has been had. There has not been sufficient experimental work done throughout the province to warrant us in recommending every farmer to grow alfalfa extensively, but such excellent crops have been secured here and at a number of other points in Manitoba that we are warranted in suggesting that every farmer give it a trial. If the excellent qualities of the plant as a forage crop were known, with the conditions necessary to its successful cultivation, it would undoubtedly be grown much more extensively.

Alfalfa requires a well drained soil and will not thrive on land where water lies at any time of the year. Sandy loam with a porous subsoil is usually considered ideal but the nature of the surface soil is of comparatively little importance. The most essential requisite in soil is that the water level be not closer than three feet to the surface.

, The preparation of the soil is also important. Land in good condition that has been cropped for several years is preferable to new land. One of the best preparations is a crop of potatoes or roots, or summer-fallow is quite suitable. The important features are, that the land be fairly clean and quite free from grass, and in at least a fair state of fertility. Good catches have been secured on suitable land ploughed either in the spring or fall and well top-worked, but potato land or summer-fallow is to be preferred.

Alfalfa, like all other legumes, is able to utilize the nitrogen of the air in its growth and to this is largely due its value as a soil renovator and a fodder. This important function is performed through the medium of bacteria which find lodgment in the roots of the plants. Their presence is indicated by the formation of small nodules or excrescences on the roots about the size of a pin head. These frequently appear in bunches and are usually found on the younger parts of the roots. The absence of these nodules is an indication that the soil does not contain the bacteria. The alfalfa will grow the first season without these bacteria being present, but it lacks stamina and vigour and is apt to succumb during the first winter.

Our prairie soils sometimes have these bacteria present naturally, but otherwise it is necessary to inoculate. This can most readily be done by securing soil from a field where alfalfa has been being growing successfully and scattering it over the land at the rate of from 100 to 200 pounds per acre. This may be done to advantage immediately before sowing the seed, but it may, if necessary, be distributed after the alfalfa is growing as it will gradually be washed in with the rain.

It is not always necessary to inoculate the land, but it is always advisable, as the chances of success are thereby increased. The Experimental Farm will furnish 100 pounds of inoculated soil free to farmers in Manitoba who apply for it. The applicant will have to pay the freight from Brandon.

Several strains of seed have been under trial, but up to the present there has been very little difference in hardiness shown. Turkestan alfalfa is generally considered somewhat hardier than the common alfalfa but it is not always so. Grimm's alfalfa, a strain grown in Minnesota for some years, has been found somewhat hardier than any other strain tested at the Experimental Farm, Indian Head, Sask. A plot of Grimm's alfalfa sown at Brandon in the spring of 1908, has given good returns and has not winter killed, but neither has any of the other strains sown the same year.

The seed may be sown any time after the middle of May until July 1. A nurse crop of grain should never be used in this climate, as alfalfa sown with a nurse crop has always been a failure. Fifteen or twenty pounds of seed per acre is sufficient.

For several years we have sown our alfalfa with the ordinary grain drill. The seed is mixed with about twice the quantity of coarsely chopped barley or wheat to regulate the feed. The seed can be sown at a uniform depth by this method and is much better covered than when sown broadcast.

The plants should be clipped once or twice with a mower during the first season. This keeps weeds from seeding and makes the young plants root better. The cuttings may be allowed to lie on the ground as a mulch unless they are very heavy. The last clipping should not be later than August 15, as the alfalfa should go into the winter with a good top. The alfalfa should not on any account be pastured the first season and should never be pastured close.

Much of the value of alfalfa hay depends upon the curing. After it starts to bloom the stalks rapidly become hard and woody and lose their feeding value. It should, therefore, be cut as soon as it commences to bloom, or, as it is sometimes stated, when it is one-tenth in bloom. The most nutritious part of the plant is the leaves, and, to save the leaves, the curing must be done in the cock. It should be raked into windrows soon after cutting and at once put into small cocks to cure. In this way, the leaves are all retained on the stalks and the hay has not lost any of its nourishing qualities. It is usually an advantage to upset the cocks an hour or two before stacking or drawing to the barn, to air the part that has been next the ground. Two cuttings are usually all that can be secured in Manitoba in a season. The last cutting should not be made later than the middle of August to enable the plants to make some growth before winter.

To those who contemplate growing alfalfa, I would suggest that it be tried first on a small scale, not more than one or two acres. When a small area becomes established, it will furnish soil to inoculate as much land as it is desired to sow.

Several different strains of alfalfa are growing at present on the Experimental Farm. These were sown in 1907 and 1908. There has been practically no winter killing up to the present. The mixtures of alfalfa with Rye grass and Timothy yield a crop of mixed hay at the first cutting and a crop of pure alfalfa at the second cutting.

ALFALFA PLOTS SOWN IN 1907 AND 1908.

YIELD OF HAY IN 1910.

Name.	Year Sown.	Yield per Acre.				Total Yield per Acre.	
		1st Cutting, June 27.		2nd Cutting, July 29.			
		Tons	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Alfalfa (Indian Head seed)	1907	1	1,000	..	1,900	2	900
Alfalfa (Common)	1907	1	625	..	1,200	1	1,825
Grimm's alfalfa	1908	1	1,200	..	1,000	2	200
Turkestan alfalfa	1908	1	500	..	475	1	975
Alfalfa and Timothy	1908	..	1,550	..	275	..	1,825
Alfalfa and Rye grass	1908	..	1,100	..	350	..	1,450

The most notable point in this table of yields is the position of the mixtures of alfalfa with Western Rye grass and with Timothy. The yield from these mixtures in 1909, the first year they were cropped, compared favourably with the alfalfa sown alone, but the falling off this year is most marked. The second crop was practically nil. The reason may be that the grass prevented the alfalfa from becoming properly established; in consequence the root system did not extend so deeply and the effect of the drought was greater on this account.

The grass and alfalfa seed was sown the same year in these plots. It appears that it would be advisable when grasses mixed with alfalfa are to be grown that a year should be given the alfalfa to become properly established, and that the following year the grass seed should be sown and harrowed in.

ALFALFA PLOTS SOWN IN 1909.

In the spring of 1909 several samples of alfalfa seed were received from Chas. J. Brand, of the Department of Agriculture, Washington, D.C. In June, 1909, the seed was sown in plots of one-twentieth of an acre and a fairly good stand secured. The plants were clipped once during the summer and went into the winter with about ten inches of top.

The yield of hay from each plot is given in the following table:—

Name and Number.	Yield per Acre of Cured Hay.				Total Yield.	
	1st Cutting, June 27.		2nd Cutting, July 29.			
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Grimm's, 25102	..	1,500	..	1,200	1	700
Canadian Variegated Flowered, 24837	..	1,900	..	1,500	1	1,400
Sand Lucerne, 23394	..	1,800	..	1,500	1	1,300
Northern Turkestan, 23203	1	.....	..	1,600	1	1,600
Canadian Purple Flowered, 24836	..	1,800	..	1,400	1	1,200
Provence, France, 22636	1	100	..	1,700	1	1,800
Grimm's, 21735	1	800	..	1,700	2	500
Sand Lucerne, 23481	1	300	1	100	2	400
Montana, 23154	1	300	..	1,800	2	100
Frankish, 25022	1	400	..	1,900	2	300

These varieties were sown primarily to test their relative hardiness in this climate, their yield being a secondary consideration. As stated above they had a good top in the fall and were well covered with snow all winter.

Early in the spring as soon as growth started a careful examination was made of all the plots, but not a single dead plant was found. This is no evidence that these strains are equally hardy, but merely goes to show that the winter of 1909-10 was not a severe one on alfalfa under the conditions that prevailed here. The real test of hardiness can be determined only in a severe winter when the tender strains would be more or less killed.

In addition to the strains referred to above, twenty-seven others were received at the same time. As there was no land in suitable condition for sowing in 1909, these were not put in till last spring. In June one row of each variety was sown and in the fall one hundred plants were counted in each row and stakes driven to mark off this number. Next spring the number of living plants in the hundred of each variety will be ascertained.

The stand obtained was only fairly good on account of the extremely dry summer. There were more than one hundred plants of all varieties except *Medicago falcata*. This is an interesting new variety recently introduced from Siberia. It is considered very hardy, but is prostrate in habit of growth and would not therefore be valuable except for crossing with other varieties.

A list of the varieties sown follows—

Number.
25167. Erfurt, Germany. Hardy Thuringian alfalfa.
25167. Erfurt, Germany. Hardy Thuringian alfalfa.
25115. Bromberg, Prussia.
25269. Frasinet, Roumania.
25257. Bavarian Palatinate. Pfalzer lucerne.
21232. Mongolia.
25270. Vasluiu, Roumania.
25271. Belfontaine, Ohio, U.S.A.
23396. Germany. Commercial Sand Lucerne.
24376. Arabia.
21217. Lecoq's Commercial Sand Lucerne.
20896. Vilmorin's Commercial Sand Lucerne.
22636. Provence, France.
21945. Sextorp, Neb., U.S.A. (Dryland).
22946. Baltic, S. Dak. Wheeler's selections.
24451. Siberia. *Medicago ruthenica.*
23454. Chinook, Montana, U.S.A.
25179. Vienna. Hungarian Lucerne.
22834. Wessel. Duval Peruvian.
23203. Werny. Northern Turkestan.
25176. Berlin, Germany. Commercial Bohemian Sand Lucerne.
24452. Siberia. *Medicago falcata.*
18629. Canadian.
21867. Nephi Utah, U.S.A. (Dryland).
22467. Alt-Deutsche Frankische.
23481. Leifman's Bohemian Sand Lucerne.
21247. Canadian.

NEW SEEDINGS OF ALFALFA.

For Seed.

About two acres were sown with Grimm alfalfa in June for seed purposes. The seed was sown thinly in rows thirty inches apart to give the plants ample room as the seed is produced mainly on the branches.

A fairly good stand was obtained. The plants went into the winter with a top of 8 to 12 inches.

For Hay.

Twenty acres of land that had been summer-fallowed in 1909 was sown to alfalfa in June and an excellent catch secured. The seed was sown at the rate of eighteen pounds per acre with the ordinary grain drill. The mower was run over the field late in August to cut weeds and induce the plants to root deeply. When winter set in the

plants were about ten inches high. Half of the area was sown with Montana seed and half with seed from Idaho.

CLOVERS AND GRASSES.

The clover came through the winter without any loss, but as the weather was very dry, good yields were impossible. About twenty acres were seeded down with oats in 1909, but only a fair catch was secured on account of the dry weather, particularly after harvest. Two acres of light dry land was a particularly poor stand in the spring, so was ploughed up and sown to peas and oats. The remainder yielded about one ton of hay per acre, which, considering the season, was all that could be expected.

Last spring the following seedings were made:—

Area.	Nurse Crop.	Pounds of Seed per Acre.	Remarks.
18 acres.....	Banner oats.....	Western rye grass, 4 lbs.; timothy, 3 lbs.; red clover, 6 lbs...........	Fairly good stand.
6 acres.....	Banner oats.....	Timothy, 4 lbs.; red clover, 8 lbs... .	Thin stand.
6 acres.....	Mensury barley.	Timothy, 5 lbs.; alsike, 4 lbs.; red clover, 3 lbs.....................	Good stand; part of land liable to be flooded in spring.
8 acres.....	Mensury barley.	Western rye grass, 6 lbs.; red clover, 6 lbs.; timothy, 3 lbs........	Good stand.
8½ acres....	Mensury barley.	Western rye grass, 6 lbs.; red clover, 6 lbs.; timothy, 3 lbs............	On hill side with southern slope; light crop of barley; thin stand.

It will be noted that in each of these mixtures Red Clover is included, and that in several it comprises the principal part of the seed. This use of Red Clover is warranted by the excellent results we have had from its use here for a number of years. When grown with Western Rye grass and Timothy the yield of hay is heavier than when the grasses are grown alone and the aftermath is much heavier for pasture purposes. The quality of the hay is also better and is much easier handled. This is particularly true of the Western Rye grass which is inclined to be stiff and slippery.

When Red Clover is sown with a nurse crop the stubble should be left long to hold the snow, and cattle should not be allowed on the field after harvest unless for a few days. If the clover is well rooted in the fall and is not pastured off it is almost sure to come through the winter safely, but if it is eaten down close to the crown after harvest the chances for success are greatly reduced.

The following table gives the yield of cured hay per acre on a number of plots of clover, grasses and mixtures sown in 1907, 1908 and 1909:—

Clovers and Grasses.

Name.	Size of Plot.	Year Sown.	Yield per Acre.
			Lbs.
Red Clover (Trifolium pratense)................	1/5 acre..........	1907............	1,275
Alsike Clover (Trifolium hybridum)..	1/6 "	1907............	775
Timothy (Phleum pratense)....	1/5 "	1907............	1,225
Western Rye Grass (Agropyrum tenerum).	1/5 "	1907............	1,600
Western Rye Grass and Red Clover.................	1/5 "	1907............	1,700
Timothy and Red Clover....	1/5 "	1907............	1,075
Timothy and Alsike	1/5 "	1907............	1,000
Orchard Grass (Dactylis glomerata)	1/5 "	1908............	500
English Blue Grass or Meadow Fescue (Festuca elatior)...........................	1/20 "	1909............	1,900
Red Clover	1/20 "	1909............	2,200
Orel Red Clover..................................	1/20 "	1909............	1,700

The yield from the plot of Red Clover sown in 1907 is naturally lower than from the one sown in 1909, as the former was more than half killed out. Red Clover is not expected to last longer than two years.

Orel Red Clover was obtained from the Department of Agriculture, Washington, D.C. It is a clover of Russian origin and is supposed to be considerably hardier than the ordinary Red Clover, which it resembles closely in habit of growth. The chief difference is in its having stalks which are smooth, whereas the stems of the ordinary clover are covered with hairs. This smoothness should be an advantage as the hay produced would be comparatively free from dust. So far there has been no difference in hardiness apparent.

Orchard Grass and Meadow Fescue are both pre-eminently pasture grasses, as they are early to start in the spring and produce an abundant aftermath soon after the hay is cut. The Orchard Grass is adapted to rich soils while the Meadow Fescue will thrive on lighter soils.

SUMMARY OF CROPS, 1910.

	Bushels.
Wheat—	
5 varieties, 57 acres	1,165½
Oats—	
3 varieties, 60 acres	2,184
Barley—	
3 varieties, 41 acres	1,255
Potatoes—	
¾ acre	140
Roots	2,360
	Tons.
Fodder corn	144
Hay—	
Alfalfa, 7 acres	18
Timothy, Western Rye grass and Red Clover	7
Timothy and Red Clover	19
Brome, Western Rye grass, Timothy	3
Brome	12
Wild hay cut in coulees and sloughs	15
Rye grass	2
	80

CORN GROWING IN MANITOBA.

In view of the fact that a greater interest is being taken in the growing of Indian Corn (*Zea Mays*) from year to year, and as many letters of inquiry are received concerning the cultivation and handling of the crop, it has been considered advisable to describe briefly the methods that we have found most suitable in its production.

Corn has been successfully grown in this province long enough to be considered past the experimental stage, and if its merits were better known, it would be grown much more extensively than it is to-day. While it cannot usually be matured in this

climate, all who have given it a fair trial agree that it grows luxuriantly under our climatic and soil conditions and produces more fodder per acre than any other crop we can grow. It responds liberally to manure and cultivation and can be utilized as a means of clearing the land of troublesome weeds.

Corn will thrive on any fertile soil that is well drained. Some growers prefer a warm soil with a southern exposure, and while this may be an advantage it is not a necessity. A late cold soil is not suitable and should always be drained before being planted to corn.

It is a gross feeder and will thrive on any soil no matter how rich. No crop will make better use of manure than corn and a good application should always be made for this crop. Ideal conditions for its growth may be secured by ploughing sod land in the summer after applying about fifteen tons of manure per acre, working it at intervals during the late summer and fall and the following spring. Such a soil is rich in decaying vegetable matter and while it might produce too rank a growth of straw if sown to a grain crop, it will produce corn abundantly. A sod is not necessary, however, for good results. Stubble land ploughed either in fall or spring and well manured will give satisfactory returns. No other crop on the farm will make better use of the manure.

It is not advisable in this climate to sow the larger late varieties as they are so far from maturity when the time for cutting arrives that they are deficient in quality The earlier varieties do not produce as great a bulk of feed per acre, but if sown in good time they are well cobbed by September 10, and hence have much greater feeding value. We have found Northwestern Dent a very satisfactory variety in every respect. It is a red corn that grows from seven to ten feet high and is well advanced toward maturity in our short season. Other good varieties in order of earliness are Golden Dent, Mercer, Compton's Early and Longfellow.

It is not safe to sow much before May 20, but there should be no delay after this date. The corn planter is the most satisfactory implement for sowing, but unless a considerable acreage is to be sown it would not pay to invest in one. The ordinary grain drill can be made to answer the purpose. A sufficient number of spouts should be plugged up so that the rows will be three or three and a half feet apart. The latter distance allows the cultivator to be used to better advantage, but for small varieties three feet between the rows is quite satisfactory. Twenty pounds of seed is sufficient for an acre, and if it all grows it will require thinning. Before starting to sow, the drill should be tried on a hard road or the barn floor to see that the kernels are being dropped evenly every four or five inches.

The success of the corn crop depends very largely upon the cultivation that it receives during its growth. It is a good crop as a land cleaner only if full advantage is taken of the opportunity to cultivate the land that the method of sowing affords. Cultivation should start a few days after the corn is sown and should continue at intervals until it is about six feet high. The cultivation serves not only to kill weeds and to conserve moisture, but also to stimulate the growth.

The first two or three cultivations should be given with the drag harrow. It should be harrowed once before it is up and once or twice after until it is six inches high, the harrows being used lengthwise of the rows to prevent injury from tramping by the horses. A few stalks of corn will be rooted up, but so also will myriads of weeds that have not yet showed above ground. The harrow is the cheapest weed killer we have if used at the proper time. The cultivator should be started as soon as the corn is too high to permit the harrow to be used, and it should be used as frequently as other work will permit; sufficiently often at least to keep weeds in check. Cultivation after each rain is advisable to keep the soil stirred and thus prevent evaporation. For use until the corn is three or three and a half feet high, the two-horse riding cultivator that straddles a row is much to be preferred to the one-horse cultivator, as it will cultivate the soil more thoroughly, particularly if it is hard. After the corn is too

high for the two-horse machine the one-horse cultivator will be required to complete the season's work. Cultivation should not be deep at any time and should get shallower as the season advances.

To make the cultivation complete some hand work with hoes is usually necessary. This can best be done when the corn is about a foot high. If the corn is too thick in the row it should be thinned with the hoes to leave the stalks not closer than eight inches apart.

The hand work can be greatly simplified by sowing the corn in check rows or hills. This permits the cultivator being used both ways and enables the soil to be more thorougly stirred. This reduces the hand work to a minimum, and it can almost be dispensed with, although this is not advisable.

The most satisfactory method of harvesting is by means of the corn harvester which cuts a row at a time and binds it in sheaves. Where several farmers in a district are growing corn it is well worth while getting one of these machines on a partnership basis. If only a few acres are to be harvested the sickle may be used, as the ordinary grain binder is far from satisfactory, except in a very light crop.

Corn may be used for feed, either as a soiling crop, as dry fodder, or as ensilage. As a soiling crop it is of little use before the middle of August, as it is too immature. After this date it may to advantage be cut and fed twice a day to milking cows to supplement pastures that are usually bare at that season. Cows relish it fed in this way, and it may be depended on to augment the milk flow at a time when pasture is scarce.

At present it is as dry fodder for winter feed that corn is most generally used, and this will continue to be the case for some years. When grown for this purpose the corn should be stooked at cutting time. From ten to twenty sheaves should be put in a stook which should be tied securely near the top with binder twine to prevent its blowing over. After the corn is thoroughly cured it may be drawn to the barn if room is available, and stored. It heats readily if too great a bulk is put together so that it should be stood in rows not deeper than two feet. Occasionally it is built into a mow or stack in alternate layers with straw. The layers of straw should be about two feet thick to absorb moisture and prevent the corn moulding. When stored in this way the corn imparts some of its flavour to the straw and renders it more palatable to stock.

It is quite a common practice to draw the corn from the field as it is required during the winter. The principal objection to this method is that deep snow sometimes interferes and there is a considerable loss of fodder in handling.

The dry corn fodder may be fed whole to cattle or horses, but there is usually considerable loss of the coarse stalks when it is fed in this way. A better way is to run it through a cutting box and feed it mixed with cut straw. The mixing may be in fact done to advantage by cutting straw and corn alternately. The mixture will heat less readily than the pure corn, and the cutting may be done once a week or less frequently as required.

SILOS.

The ideal way to handle corn is by means of the silo. There are few of these in use in Manitoba at present, but as corn is grown more extensively, and a greater interest taken in keeping stock supplied with succulent nourishing food through the winter, they will rapidly come into general use.

When cut for the silo the corn should be in the firm dough stage—usually in Manitoba it should be as nearly ripe as it can be secured. If very succulent when cut, it should be allowed to wilt for two or three days in the field before cutting into the silo, but if fairly well matured it can go without delay. For filling silos there are two types of machines, the chain elevator cutting box and the blower, either of which can be used to cut and elevate the corn thirty feet high or more. When there is a powerful engine

available, plenty of men and teams and a lot of corn to handle, the blower is much to be preferred. Where, however, there is a small force and only a sweep or tread horse power, or a small engine, the chain elevator box will be found most satisfactory.

As the corn is cut into the silo the leaves and stalks should be well mixed in the silo to insure even settling. If the corn is very dry a few pails of water may be poured around the edge as it is being filled. This may be repeated two or three times to advantage. After filling is completed, no further treatment is required except to tramp the ensilage once a day for several days around the edge of the silo. A layer of partially decayed matter soon forms over the surface which effectually excludes the air

If the ensilage is required for feeding as soon as the silo is filled, there will be no loss from decayed matter, but if, as is more usually the case, it is not required for several months, from four to six inches will require to be removed as waste. The ensilage may be fed by itself or it may before being fed be mixed to advantage with cut straw or hay. The method followed here in feeding ensilage is to build up in alternate layers cut straw, ensilage and roots sufficient to feed the entire stock for two or sometimes three days. The straw absorbs some of the juices and flavour from the ensilage and roots and, when fed, the whole makes a highly palatable mixture that is eaten with very little waste. The allowance of meal is scattered on this mixture after it is in the manger. This method of preparing the feed enables considerable coarse and comparatively rough feed to be utilized to good advantage, and is particularly adapted to utilizin any frozen ensilage. Freezing does not injure the quality of the ensilage, and when it is incorporated with the other feeds and allowed to undergo slight fermentation no injurious results can possibly follow.

Two silos each nine feet square and twenty-four feet high were in use on this Farm for fifteen years, and gave good satisfaction. The chief objection to them was the loss entailed through improper settling in the corners and consequent moulding and decay. These silos were located inside the barn and hence there was little freezing.

In the summer of 1908 a new silo was built to take the place of the old ones as the lumber had decayed to such an extent as to impair their usefulness.

The new silo was built outside the north side of the barn, located so that the ensilage was in the middle of the cattle stable. The bottom is on a level with the stable floor and the cement work extends two feet above the surface of the ground. On the cement foundation a superstructure of staves was erected, the lumber used being 6-inch by 2-inch by 20 feet. This made the silo 33 feet high to the roof.

The silo has now been in use three seasons. The only objection to it is the amount of freezing which takes place in very severe weather. As already mentioned freezing does not actually impair the feeding quality. When much freezing occurs there is considerable difficulty in detaching the ensilage from the walls and in incorporating a large quantity of it with the other feed. There is a notable difference in the amount of freezing on the staves and that on the cement work which extends above the ground surface. As the cement is a better conductor than the wood the freezing has always been much worse on the cement. Except in continued very severe weather there has being little freezing on the staves when care has been taken to keep the edges lower than the body of the ensilage.

Cement undoubtedly has the advantage in durability but a well built stave silo should last fifteen years and the initial expense of building is less. The advantage that it has over cement as regards frost is well worth considering.

A silo built of hollow cement blocks would have advantages over the solid cement wall as the air space would considerably reduce the liability of freezing. Hollow tile as a construction material for silos is also worthy of consideration in this climate for the same reason.

Those contemplating the construction of a stave silo should secure a copy of Bulletin 35 of the Experimental Farms on 'Stave Silos.' This may be had free on application.

INDIAN CORN—TEST OF VARIETIES.

Fifteen varieties of fodder corn were grown under uniform conditions last year. The land was a clay loam which had been fallowed in 1909. The corn was sown June 4, in rows 40 inches apart. It made excellent progress until the middle of July but about that date drought began to have its effects and the subsequent growth was slow. A frost on August 31, withered the leaves considerably and this reduced the weight. The crop was cut for ensilage on September 3. The yield per acre in each case is estimated from the product of two rows each 66 feet long.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

No.	Name of Variety.	Average Height.	Condition when Cut.	Weight per Acre Grown in Rows.	
		Inches.		Tons.	Lbs.
1	Longfellow	82	Silk	21	966
2	Compton's Early	96	"	20	194
3	Mercer	83	Early milk	19	610
4	Golden Dent	74	Soft dough	14	1893
5	Selected Leaming	96	Silk	14	1700
6	Northwestern Dent	84	Late milk	13	1720
7	Jehu	61	Firm dough	13	1126
8	Square Deal	87	Early milk	12	1146
9	Superior Fodder	92	Tassel	11	770
10	White Cap Yellow Dent	97	Silk	11	374
11	Quebec Yellow	64	Firm dough	11	176
12	Paterson	53	"	8	1622
13	Eureka	56	Not in tassel	8	236
14	Champion White Pearl	64	Tassel	7	256
15	Angel of Midnight	48	"	4	1702

Angel of Midnight, Eureka, and Champion White Pearl were planted too close to a row of maples and their growth was seriously affected. The nearest row was twenty-four feet from the maples, but the influence of the trees extended over thirty feet. The average yield of these three varieties for the five years 1905 to 1909, was respectively, Angel of Midnight, 18 tons, 1,908 lbs.; Eureka 17 tons, 24 lbs.; Champion White Pearl, 16 tons, 1,256 lbs.

INDIAN CORN IN FIELD LOTS.

Three varieties of corn were grown in field lots last year as follows: Northwestern Dent 7 acres, Mercer 8 acres, Golden Dent 3 acres.

The best crop was four acres of Northwestern Dent sown on fall-ploughed oat stubble, well manured. This piece was planted in check rows 40 inches apart and horse cultivation was given in both directions. The average yield for the whole crop was 8 tons per acre.

CATTLE.

There are representatives of two breeds of cattle on the Experimental Farm—Shorthorns and Ayrshires—and a number of grade cattle and steers.

The cattle on hand at present are:—

Shorthorns.—1 bull, 11 cows, and 3 calves.

Ayrshires.—1 bull, 1 cow, and 1 calf.

Grades.—2 cows and 21 steers, three years old, for experimental feeding.

MILK RECORD FOR 1910-11.

Name.	Breed.	No. of Days Milking.	No. Lbs. Milk.
Buttercup	Grade	365	6,176
Margaret	"	304	5,601
Daisy	Shorthorn	305	5,109
Rose	"	315	4,831
Snowball	Ayrshire	303	4,488
Jane	Shorthorn	259	3,836
Poppy	"	352	3,878
Hazel	"	284	3,648
Blanche	Grade	241	3,047

BEEF PRODUCTION.

Fed Outside versus Inside.

The system of outside feeding which was inaugurated here three years ago was given another trial, but the results were not altogether satisfactory. The conditions under which the two lots of cattle were fed were described in last year's report, and need not further be detailed here, but a few modifications were made which will be mentioned since they undoubtedly had some effect on the results.

The first two years this experiment was in progress the cattle secured water from a small stream in the feed lot. The winter of 1907-8 was mild so there was little difficulty encountered in keeping the water open and the cattle had access to it at all times. No other provision was made for a supply the following year, but as the winter was a severe one, the water supply was a constant source of trouble and required much attention, and even then was not satisfactory. The cattle frequently did not want water when it was open, and then when they required it, the stream was frozen over.

It was therefore decided to make other provision for a supply for another year, and accordingly a well was sunk and a trough with a tank heater provided. The tank heater is a round cast iron stove that sits in the trough and is bolted to the bottom with wood screws. The air passes down a flue at one side, under the grate on which the fire is placed and out a short chimney. Either coal or wood may be used for fuel. The heater gave excellent satisfaction; a very small fire was sufficient to keep the water from freezing and no effort was made to do more than this. Soft coal was used as fuel.

Several changes were also made in the method of feeding. In previous years oat straw was the principal roughage used. This was fed until March or April, after which time hay was substituted. The grain ration during the first two seasons was limited throughout the feeding period. About four pounds per head per day was fed at the start. This quantity was gradually increased, about twelve pounds per day being fed toward the close of the period.

Last year the hay that was available was fed from the start when the grain ration was light, and when the grain ration approached full feed oat straw was substituted. The grain ration was also heavier than in previous years. Four pounds per day was the ration December 1, and this was increased slightly every week so that by the end of January it was 15 pounds per day. After this date the steers were given practically all the grain they would clean up—this averaged about 17 pounds per day and occasionally was as much as 20 lbs.

Those inside were given the same feed and care as in previous years.

The following prices were charged for feed—

	Per ton.
Grain	$20 00
Bran	18 00
Linseed meal	30 00
Slough hay	4 00
Straw	1 00
Ensilage	2 00
Roots	2 00

Complete details of the experiment follow.

LOT 1. OUTSIDE STEERS. 1909-10.

No. of steers in lot		20
First weight, gross	lbs.	20,960
" average	"	1,048
Finished weight, gross	"	24,150
" average	"	1,207
Total gain in 155 days	"	3,190
Average gain per steer	"	159·5
Daily " "	"	1·0
" " lot	"	20
Gross cost of feed		$ 591 29
Cost of 100 lbs. gain		18 53
" of steers		707 40
Total cost to produce beef		1,298 69
Sold 24,150 lbs. at 5½ cents less 5 per cent		1,261 85
Profit on lot none—loss		36 84
Net profit per steer none—loss		1 84
Average buying price		35 37
" selling "		63 07
" increase in value		27 72
" cost of feed per steer		29 57
Amount of grain eaten by lot	lbs.	43,906
" linseed meal	"	930
" bran	"	920
" hay	tons	29
" straw	"	14

LOT 2. INSIDE STEERS 1909-10.

No. of steers in lot		16
First weight, gross	lbs.	16,755
" average	"	1,047
Finished weight, gross	"	20,630
" average	"	1,289
Total gain in 155 days	"	3,875
Average gain per steer	"	242
Daily gain per steer	"	1·56
Daily gain per lot	"	24·9
Gross cost of feed		$ 292 05
Cost of 100 lbs. gain		7 73
Cost of steers		565 48

Total cost of produce beef	$	857 53
Sold 24,150 lbs at 5½ cts. less 5 per cent.		1,077 87
Profit on lot		220 34
Net profit per steer		13 77
Average buying price		35 33
" selling price		67 36
" increase in value		32 03
" cost of feed per steer		18 25

Amount of grain eaten by lot	lbs.	15,994
" linseed meal	"	744
" bran	"	736
" hay	"	7,312
" straw	"	14,315
" ensilage	"	84,880
" roots	"	9,216

The great difference in the cost of 100 pounds gain in the two lots is notable as in the case of these fed outside it is much greater than in the previous experiments conducted. It is clearly evident that the outside lot made poor use of the grain consumed. The average daily ration amounted to slightly over 14 pounds per head per day during the whole period and the average gain in weight was only one pound per day.

The poor gains are due mainly to the method of feeding outlined above. It was evident to any one watching the progress of the cattle throughout the period that they were not making such gains as would naturally have been expected from the feed consumed but since the object of the experiment was to gain information it was not thought advisable to change the method during the feeding period.

Good gains were made until the middle of January. Hay had been fed as roughage up to that time and the grain ration had been gradually increased from 4 pounds per day to 10 pounds per day and was then increased steadily to full feed. The cattle did not take kindly to the straw, in fact they ate very little of it and subsisted almost entirely on the grain. The consequence was that many of them scoured for a time and of course lost in weight. It took them several weeks to regain what they had lost.

The gains made from time to time are shown clearly by the following average weights:—

Date of weighing.	Average weight of 20 steers.
December 1	1,047 lbs.
January 4	1,115 "
February 2	1,090 "
March 2	1,115 "
March 16	1,150 "
April 1	1,179 "
May 5	1,207 "

It will be noted that the weight March 2, is the same as January 4, so that the feed consumed during this period of two months, 19,825 lbs., was a straight loss. Had it not been for this set back it is easy to compute a good profit instead of a slight loss.

In figuring the gain or loss per head it should be remembered that the grain fed is valued at $1 per hundred. The *actual* price realized on the grain fed the cattle outside was 91·1 cents per hundred, a reasonably good price to say the least

Amount of meal for 1 lb. gain live weight . . . . .lbs.	3·35
" roots for 1 lb. gain live weight . . . . "	·65
" tankage for 1 lb. gain live weight . . . . . . "	·48
Total cost of ration	$ 18 46
Cost of 1 lb. gain live weight . . . . .cts.	4·1

LOT 5. MIXED CHOP AND TANKAGE.

Number of pigs in lot	5
Gross weight at start. . . . . .lbs.	553
Average weight at start . . . . "	110·3
Gross weight at end of 86 day period. . . . . "	1,086
Average " " " . . . . "	217·2
Gross gain in 86 days. . . . . "	533
Average gain in 86 days . . . . "	106·6
Average gain per pig in one day . . . . "	1·23
Total amount of meal consumed . . . . "	1,635
" " roots consumed . . . . "	280
" " tankage consumed . . . . "	178½
Amount of meal for 1 lb. gain, live weight . . . . "	3·12
" roots " " . . . . "	·52
" tankage " " . . . . "	·33
Total cost of ration . . . .$	23 65
Cost for 1 lb. gain, live weight . . . . .cts.	4·4

HORSES.

Horses are kept for work only. Those at present on the Farm consist of nine heavy farm horses and two light horses for driving and occasional light farm work. One old driving horse was sold during the year and has not yet been replaced. The horses have continued in good health during the year.

POULTRY.

Three breeds of poultry are kept: Barred Plymouth Rocks, Buff Orpingtons and Silver Grey Dorkings. Sixty chickens were hatched during the year and a number of cockerels have been sold for breeding purposes. The flock at present consists of:—

Barred Plymouth Rocks.—1 Cockerel and 16 hens.
Buff Orpingtons.—11 hens.
Silver Grey Dorkings.—12 hens.

SHEEP.

A small flock of sheep have been added to the stock since the last report. This is the first time since the establishment of the Farm that any sheep have been kept. The object in adding them now is mainly to determine their usefulness for improving poor light land that is of little use for grain production, and to carry on some experimental feeding.

A part of the Farm consisting of forty acres of light land on the hill top has been set aside as a sheep farm and is to be cropped as Rotation S. (See Rotations for particulars). Instead of buying a flock of pure breeds it was decided to buy such sheep

as an ordinary farmer would secure if he were starting to raise sheep. Accordingly twenty-five head of young grade range ewes were bought in October at an average cost of $7.35 per head. To these were added a good pure-bred Oxford ram and two Oxford ewes of pure breeding and excellent conformation. Other pure bred ewes will probably be added from time to time and an effort made to breed a flock of good commercial value without a high initial expenditure.

FENCING.

The rotation work has entailed the erection of a considerable quantity of new fence to enable the land to be pastured when the rotations call for it. The fencing was necessary with rotations A, B, F, and S. In rotation A and B permanent division fences were erected but in S the outside fence only was made permanent, as portable fences are to be used for divisions when pasturing.

For the outside and division fences in A and B an eight strand No. 9 wire fence 48 inches high with 13 uprights to the rod was used. Six inches above the woven wire one strand of barb wire was stretched to prevent stock reaching over and sagging the fence. The outside fence for the sheep pasture (Rotation S) was a nine strand fence 46 inches high, all No. 9 wire with uprights 10 inches apart. The horizontal wires were spaced as follows: 3, 3½, 4, 5, 6, 7, 8, 9 inches. One strand of barbed wire was stretched six inches above the top strand of the woven fence.

This fence was selected as one which would be coyote proof and in erecting it, particular care was taken to have it close to the ground at all points to prevent coyotes crawling under it. There is a great diversity of opinion among experienced men as to the requisites of a coyote proof fence but every one agrees that it is difficult to keep coyotes out of a pasture once they have gained access to it. This should be borne in mind in erecting the fence and every precaution taken to make a close structure free from loop holes.

The distance apart of the uprights is also important, as a fence with uprights 10 inches apart will turn dogs that can easily go through one where the uprights are 16 inches apart. A barbed wire at the top is insurance against coyotes jumping even although it may not be a sure preventative. It is important also to see that all gates are of close mesh, that they are hung close to the ground, and that very little space is left between the gate and the posts, at either end.

The posts used for the fence were seven foot, green cut cedar, with six-inch tops, except the corner and gate posts which were eight feet long. They were placed twenty feet apart and all corner and gate posts were securely braced. The amount of fencing done was 2,100 rods.

We have not yet had an opportunity to see how effective the fence is against coyotes but this will be reported on from time to time.

YAKS.

In last year's report, reference was made to a herd of yaks which had been added to the stock of the Farm. Those on hand at present consist of one bull two years old, two cows two years old and one aged cow. These animals have continued in good health since the last report but have not produced any young.

They have the run of about thirty acres of rough land which provides sufficient pasturage for summer. In the winter they have no stabling other than an open shed, and are fed hay with a light grain ration.

BEES.

In the fall of 1909, fifteen hives of bees were put in winter quarters in the Superintendent's cellar, but as they had insufficient stores only one strong hive came through the winter. During the summer this hive swarmed twice and one of the new hives also threw a swarm. There was practically no honey taken and each of the swarms gathered a good supply of honey for the winter. The average weight of the hives on November 14, when they went into winter quarters, was seventy-two pounds.

THE VEGETABLE GARDEN.

Last year was too dry and hot to expect particularly good results from vegetables, but in spite of the unfavourable conditions during the spring and early summer an excellent crop was harvested.

When spring weather first opened up late in March, some seed of such crops as carrots, parsnips and onions was sown, but as the weather turned very cold in April, little or nothing was gained by the early seeding. The sharp frosts which occurred repeatedly during April, May and the early part of June cut off the young plants, but they recovered sufficiently well to render resowing unnecessary. The frosts were less injurious than the high winds which occurred at intervals during May and June. Peas, lettuce, turnips and onions which had made considerable growth by that time were badly blackened and materially thinned out. At one time the conditions were so adverse that it seemed as though the whole garden would be a total failure, but a few light showers and thorough cultivation had a wonderfully reviving effect, with the result that practically everything was saved.

The extreme heat of June and July was accompanied by so little rain that the growth was somewhat stunted. Constant cultivation was the salvation of the garden crops during those months. The most successful crops in the garden this year were squash, pumpkins, citrons, cauliflowers and cabbage. Tomatoes were a fairly good crop, but would have been greatly benefited by more rain. The same is true of carrots, parsnips, beets and celery.

The first fall frost on August 31 injured many of the tender vegetables, but not seriously. The tomatoes and squash continued to grow until a more severe frost on September 7 stopped all growth for the season.

Where practicable, the vegetables are grown in long rows so that inter-tillage can be practised to advantage. The rows in our garden were only 18 inches apart, as the cultivation was done by the Planet Junior, but where plenty of land is available the rows may to advantage be two and a half or even three feet apart, and a one-horse cultivator used for the bulk of the work.

ASPARAGUS.

An asparagus bed was planted in the spring of 1908 with two-year old roots. A small quantity was produced in 1909, but very little was cut until 1910. The asparagus was ready for use May 10, and continued in use until July 8. An application of well-rotted manure was worked into the bed late in the fall.

CARROTS.

Three varieties of carrots were grown, but the crop was light and the roots very irregular in form and of small size. Amsterdam Scarlet produced the best crop, while Half Long Chantenay and Early French Horn yielded considerably less.

PARSNIPS.

Four varieties of parsnips were sown March 17, but little was gained by such early sowing, as the weather was so unfavourable afterwards. The roots were of fair size and of excellent quality.

Following are the estimated yields per acre, calculated from 66 feet of one row:—

Variety.	Yield per Acre.	
	Bush.	Lbs.
Manitoba Prize Intermediate	337	20
Manitoba Prize Guernsey	278	40
Elcombe's Giant	242	..
Hollow Crown	198	..

ONIONS.

Ten varieties of onions for general use and two for pickling purposes were grown. The onion maggot has been very troublesome here for several years, but it did very little damage last year. The young plants were watered several times with a solution of nitrate of soda, and as this stimulated the growth it probably helped in reducing the injury. An excellent crop of well-shaped onions was harvested.

Variety.	Yield per Acre.		Description.
	Bush.	Lbs.	
Large Red Wethersfield	297	..	Flat, red.
Improved Red Globe	256	40	Red, globe.
Giant Prizetaker	223	40	White, globular.
Sutton's Ailsa Craig	216	20	White, globular.
Large Red Wethersfield (Commercial)	212	40	Red, flat.
Selected Yellow Globe	207	10	Yellow, globular.
Danver's Yellow Globe	201	40	Yellow, some flattish.
Superior Golden Globe	168	40	Yellow, globe.
Perfection Globe	154	..	White, globe.
Australian Brown	110	..	Round, brown.

Earliest White Barletta and Paris Silverskin were grown for pickling purposes, and the former proved the better variety.

BEETS.

Seven varieties of beets were grown and produced an excellent crop.

Variety.	Yield per Acre.		Description.
	Bush.	Lbs.	
Egyptian Flat Extra Early	733	20	Very coarse and not true to type.
Nutting's Dwarf Seed	616	00	Not uniform, fair quality.
Early Blood Red Turnip	542	40	Uniform and good quality and size.
Egyptian Extra Early	498	40	Fair size and quality.
Early Flat Egyptian	447	20	Some turnip shaped and rather coarse quality
New Danish Blood	366	40	Very badly mixed and poor quality.
Sutton's Pineapple	278	40	Medium size and good quality.

KOHL-RABI.

Sutton's Earliest White was grown and produced a good crop of fair size and medium quality.

CABBAGE.

An excellent crop of cabbage was grown. Of the three varieties of early cabbage, the Extra Early Paris Market was ready for use ten days before either of the others and was of quite as good quality. The Extra Early Savoy produced larger heads, but they were late and of poorer quality.

The seed of all the varieties was started in the hotbed early in April and the young plants were transplanted to the open about the first of June. A sowing of several varieties was also made outside at the time of transplanting but the heads produced were comparatively small and of poorer quality.

Variety.	Weight of Specimen Head.	
	Started in Hot-bed.	Seed Sown in Open.
	Lbs.	Lbs.
Late varieties:—		
Large Late Flat Dutch	14½	9
Fottler's Improved Brunswick	14	6½
Mammoth Marblehead	12½	....
Kildonan	10¾	5
Winningstadt	7½	6
Pickling:—		
Blood Red Pickling	8¾	3¼
Early varieties:—		
Extra Early Paris Market	8½	Extra Early, fine quality.
Early Jersey Wakefield	7¼	
Extra Early Savoy	9¾	

CAULIFLOWER.

Cauliflower was an unusually fine crop on this Farm although there were many failures reported on account of the drought and heat. Four varieties were planted out from the hotbeds early in June. The latest-maturing specimens were of very superior quality, particularly Sutton's White Queen.

Variety.	Weight of Specimen Head.	Remarks.
	Lbs.	
Sutton's White Queen	8½	Second early. Excellent quality and texture.
Earliest Erfurt	7¼	1st early. Fine quality.
Early Snowball	7	1st early. " "
Earliest Snowball	6¼	1st early. " "

SQUASH, PUMPKINS, MARROWS.

The crop of squash, pumpkins and marrows has seldom been surpassed on this Farm. Nearly all varieties produced specimens of large size and excellent quality. The seeds were planted about June 1, in hills eight feet apart each way, with the exception of the Bush Marrows, where the hills were not so far apart. The Golden Hubbard is worthy of special mention, as also is the Long White Bush Marrow, the latter for its earliness.

Seed of several varieties saved in 1909 were planted for comparison. Without exception they produced good crops. Several varieties were grown in close proximity in 1909 and they had cross fertilized to a considerable extent, as the specimens grown this year were not true to type.

Variety.	Weight of Specimen.	Remarks.
	Lbs.	
Large Etampes Pumpkin	35½	Fine quality and fairly productive.
Mammoth Whale	29½	Good quality, fairly early and very productive.
Large Yellow Globe	26	Fine quality and fairly productive.
Mammoth Tours	22	Fair quality, not true to type.
Green English Vegetable Marrow	15¾	Good quality, early and productive.
White English Vegetable Marrow	14¾	Good quality, fairly early.
Hubbard Green (Selected seed from Lethbridge)	11¼	Good quality and fairly early.
Long White Bush Marrow	11	Earliest of all and very productive.
Hubbard Green (Own seed)	10¼	Good quality and fairly early.
Golden Hubbard	10	Extra quality, very early and productive.
Green Hubbard (Seed from Central Ex. Farm	8½	Good quality, later than Golden Hubbard.

CITRON.

Three varieties of citron produced an excellent crop. The seed was planted in hills about June 1.

Variety.	Weight of Specimen.		Remarks.
	Lbs.	Oz.	
Colorado Preserving	12	8	Fine quality and fairly productive.
Green Seeded	10	..	Fine quality and fairly productive.
Red Seeded	7	8	Fine quality and very productive.

MELONS.

Several varieties of both watermelons and musk melons were grown outside and ripened fruit of fair size and excellent quality.

TOMATOES.

The past season proved quite favourable to the tomato crop and a large proportion of the fruit ripened. The plants were somewhat injured in June by the extremely high winds and this undoubtedly made the crop somewhat later than it would otherwise have been.

Three strains of Earliana were grown; one to commercial seed, another a selected strain from the Central Experimental Farm and a third was from seed produced here of the Central Experimental Farm's strain. The difference in these strains was very marked. The strain of home grown seed ripened fruit a full week ahead of the commercial strain and five days earlier than the C. E. F strain. In saving tomato seed the aim should be to get it from early maturing specimens of good conformation.

Such excellent results have followed the practice of growing and staking the tomato plants that this method of growing was again followed. The plants are pruned from one main stalk, very few of the laterals being allowed to grow. Stakes two inches square and four feet long are required for staking.

Last year several plants of each strain and variety were left unpruned and the yield of ripe and green fruit from three plants ascertained, to compare with the product of pruned specimens. From the results given below it will be noted that while a considerably greater total weight of fruit was obtained from the unpruned plants, the actual weight of ripe fruit was much greater where staking and pruning was practised.

TOMATOES—Yield from 3 plants.

Variety.	Pruned and Staked.						Unpruned.					
	Ripe.		Green.		Total.		Ripe.		Green.		Total.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Spark's Earliana (C.E.F. strain) Own seed	10	6½	7	12	18	2½	2	2	37	..	39	2
Spark's Earliana, C.E.F. seed	6	7	11	6	17	13	..	14½	39	..	39	14½
Spark's Earliana, Commercial seed	6	2	13	7	19	9	1	7	48	..	49	7
Chalk's Early Jewel	3	5	12	15	16	4	..	5½	33	..	33	5½

WONDERBERRY.

This fruit was tried again last year and with very good success. The seed should be sown in a hotbed like tomatoes or cabbage, and the young plants transplanted to the open when danger of frost is over. The plants are of spreading habit of growth and should be planted four feet apart in a row. They are considerably hardier than tomato plants and will continue to grow and ripen fruit after the tomatoes are frozen in the fall. The fruit is not edible in a raw state, but is quite palatable when preserved.

FRUITS.

The fruit crop was almost a complete failure last year on account of the frequent spring frosts which occurred while the trees were in full bloom. Very few varieties of plums, cross-bred apples or currants escaped, and when any fruit was produced, it was an extremely light crop.

The apple orchards which have suffered so severely from blight for several years were practically free from it last year. In all probability there will be little trouble from that cause for some time at least.

While there was little blight, the loss from winter injury was much greater than usual. The very warm weather in March started the growth and hard frosts followed for six weeks afterwards. These conditions not only killed all the blossoms, but in many cases so seriously injured the trees that they did not recover. These severe conditions appeared to be particularly fatal to trees which had fruited the previous year. A tree of Repka Kislaga, which has wintered without injury for six years and fruited in 1909, was killed completely. Several hundred other trees of different varieties also succumbed. The vacancies thus created in the orchards were filled with a number of cross-bred varieties secured from E. D. Smith, nurseryman, Winona, Ontario.

STRAWBERRIES.

Ten varieties of strawberries were planted in the spring of 1909, and most of them grew well during the summer, but were not allowed to set any fruit. In the late fall a covering of strawy manure was applied and with this protection they wintered with very little loss.

Brandon, 1908. Stocks.

The summer was much too dry to produce a good crop, but a small quantity of [f]ruit was gathered. Fifty plants of each variety were planted. The amount of fruit [g]athered from each variety follows—

Variety.	Total Yield.	
	Lbs.	Oz
[C]rescent	1	3½
[P]ocomoke	4	12
[E]nhance	2	10
[T]enessee Prolific	2	9
[C]lyde	2	0½
[L]ovett	1	11½
[S]enator Dunlap	1	4½
[S]plendid	1	4½
[B]ederwood	.	15½
[U]ncle Jim	.	3½

FLOWERS.

In the early part of the summer the flowers had to contend with occasional frosts [a]nd many very high winds, and later with extreme heat and drought. Under these [c]onditions it is not surprising that the amount of bloom and the luxuriousness of the [p]lants fell short of what has usually been secured here. Notwithstanding the unfav[o]urable conditions many varieties both of annuals and perennials did remarkably well [a]nd furnished a succession of bloom from early June till September.

The length of the blooming season was considerably shorter than usual, particu[l]arly with the perennials, which were very seriously injured by the wind.

The hotbeds were used for starting most of the annuals and the plants were trans[f]erred to the open about June 10. The following sorts were started under glass: [A]ntirrhinum, Ageratum, Pansies, Nemesis, Verbena, Asters, Gaillardia, Stocks, [D]ianthus, Marigold, Abronia, Celosia and Tagetes patula. Others, including Poppies [o]f various kinds, Mignonette, Bartonia and Portulaca, were sown in the open. Those [s]own outside germinated very poorly on account of lack of moisture and were, on that [a]ccount, later than usual in making a good showing.

A row of sweet peas about 150 feet long was sown in October, 1909, just before [t]he freeze-up. The very warm weather during the latter part of March induced early [g]ermination and by the first of April the peas were showing above ground. When the [s]evere frost of April 16 occurred, they were from two to three inches high and many [o]f the plants did not recover after the frost. However, there were sufficient that still [p]ersisted to make it worth while leaving them and these were in bloom fully a week [e]arlier than those planted in the spring. The plants had rather a stunted appearance [a]ll through the season, and did not produce as much bloom as those sown in the spring. [T]he spring-sown sweet peas made an excellent showing, particularly in the latter part [o]f the season.

ROSES.

A consignment of roses consisting of fifty plants and comprising twenty-one varie[t]ies was received from the Central Experimental Farm in May, 1910. These were [i]mmediately planted and many of them bloomed luxuriantly during the summer. In [t]he late fall they were protected by completely covering with earth.

EXPERIMENTAL FARM FOR SOUTHERN SASKATCHEWAN

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

INDIAN HEAD, SASK., March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit to you my twenty-third annual report of the work done, and the results obtained, on the Experimental Farm for Southern Saskatchewan, at Indian Head, for the year ending March 31, 1911.

The crops in all districts in the southern portion of the province varied in yield and quality in 1910. Dry weather extended over the greater portion of the country during the growing season, and only where cultivation had been properly done, were good crops found.

From the 1st of April to the last of August, only 7·12 inches of rain fell; this included a snow storm in June which was of great benefit. Yet, notwithstanding this small amount of moisture, on the Experimental Farm, and district of Indian Head, only once in the past twenty-three years has a more bountiful or a more satisfactory grain crop been grown.

The clover and grass hay crops were rather below the average, on account of the drought.

Field roots, corn and potatoes obtained benefit from the heavy rains in August, and were all good.

Vegetables were not equal in quantity to the crop of 1909, but were superior in quality.

Fruits were a complete failure, from spring frosts killing the blossoms as they successively came out.

Spring opened from the 10th to the 15th of March, with a good many, in some districts, sowing wheat from the 15th to the 18th. The soil never was in better condition for seeding, but fear of late spring frosts kept many from starting until April.

Seeding commenced on the Experimental Farm on the 6th of April, and was general over the whole province at that date.

Harvest started on the 6th of August, and was completed on the 20th of the same month.

Threshing commenced on the 25th of August, and finished on the 22nd of September, with several delays due to rain, and to the securing of the corn crop.

EXPERIMENTS WITH SPRING WHEAT.

Wheat experiments, both in field and plot lots were very satisfactory; none of the grain lodged, it ripened evenly, and was easily harvested and threshed.

The land was prepared by ploughing six or eight inches deep before the 1st of July of the previous year. It was harrowed and cultivated as each crop of weeds appeared, then the seed was sown and harrowed afterwards.

SPRING WHEAT—TEST OF VARIETIES.

Thirteen varieties were sown on the 8th of April, in plots of one-twentieth acre each, at the rate of one and one-half bushels of seed per acre. Repeated frosts put the grain back, and the winds bared many of the roots. The yields and quality were satisfactory.

Marquis and Red Fife were the worst injured by the winds. Kubanka, in the list, is a Durum Wheat.

SPRING WHEAT—Test of Varieties.

Number of Plot.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre	Yield of Grain per Acre		Weight per measured bushel after cleaning
								Lbs.	Bush.	Lbs.	Lbs.
1	Huron	Aug.	26	134	35	10	3¼	3,280	54	40	62
2	Stanley	"	13	127	38½	9	3½	3,120	52	..	63
3	Bishop	"	20	134	37	10	3	3,080	51	20	64
4	Preston	"	20	134	41	9	3⅛	3,080	51	20	64·5
5	Pringle's Champlain	"	20	134	39	8	3¾	2,980	49	40	63·8
6	White Fife	"	20	134	38	6	4¼	2,980	49	40	61·5
7	Chelsea	"	10	124	38	10	3	2,940	49	..	64·9
8	Early Red Fife	"	13	127	39	10	3¾	2,900	48	20	64·3
9	Marquis	"	11	125	38	10	3½	2,880	48	..	65·3
10	Red Fife	"	13	127	39	8	3⅝	2,580	43	..	63·5
11	Red Fife (Smith's)	"	13	127	40	10	3½	2,560	42	40	62·9
12	Red Fife (Garton's 'Regenerated')	"	20	134	38	10	3¼	2,140	35	40	62
13	Kubanka	"	20	134	52	5	3¾	2,900	48	20	64·2

SPRING WHEAT—Test of Varieties in Field Lots.

Number of Plot.	Name of Variety.	Date of Sowing.		Date of Ripeuing.		No. of Days Maturing.	Averge Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Wieght per measured bushel after cleaning.
									In.	Lbs.	Bush.	Lbs.	Lbs.
1	Marquis	April,	6	Aug.	8	124	38	10	3½	3,186	53	06	64·5
2	Marquis	"	7	"	8	123	38	10	3½	2,676	44	36	64·5
3	Early Red Fife	"	6	"	11	127	43	10	3	2,562	42	42	63
4	Red Fife (Smith's)	"	6	"	9	125	40	10	3	2,500	41	40	62·9
5	Preston	"	8	"	8	122	42	10	3¼	2,460	41	11	61·3
6	Stanley	"	7	"	11	126	42	10	3	2,382	39	42	61·3
7	Red Fife	"	6	"	14	130	40	10	2¾	2,228	37	08	62·7
8	Bobs	"	7	"	11	126	39	10	3	2,169	36	09	63·2
9	Huron	"	8	"	8	122	41	10	3	1,991	33	11	63
10	Red Fife (On Stubble)	"	11	"	15	126	37	10	2½	1,725	28	45	64

SPRING WHEAT—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Marquis	Fallow	5⅓	53	6	283	20
Marquis	"	6½	44	36	289	52
Early Red Fife	"	3⅓	42	42	142	10
Preston	"	5½	41	11	226	..
Stanley	"	5⅛	39	42	204	37
Red Fife	"	18	37	8	668	36
Bobs	"	2	36	9	72	18
Huron	"	5½	33	11	182	..
Red Fife	Stubble	5	28	45	143	48
		56⅓			2,212	41

An average of 39 bushels, 15 lbs. per acre.

SPRING WHEAT—Four Years' Comparison of Field Lots.

The average yield per acre and time taken to mature of five varieties of wheat, grown in field lots under similar conditions for the past four years, are given below.

Variety.	Average Days to Mature.	Days earlier than Red Fife.	Average Yield per Acre.	
			Bush.	Lbs.
Preston	127	7	33	52
Huron	125	9	32	51
Stanley	128	6	31	48
Red Fife	134	....	31	22
Marquis	125	9	39	25

FALL WHEAT.

Fall wheat was sown on the 7th of September, 1909, and came up six to eight inches high before winter set in. It was alive at the roots, but quite dead above ground when the frost left the soil in the spring.

Night frosts and thaws during the day killed all by the 1st of May, except one low spot where the frost remained in the ground later than the rest of the land. The variety used was Alberta Red, formerly called Turkey Red.

EXPERIMENTS WITH OATS.

On account of sowing the oats, both in field and in uniform plots, too early, all suffered from frost and winds.

The uniform plots were entirely killed after coming up, by winds exposing the roots, and frost then killing the grain. All the varieties were resown, but too late to give reliable results.

In the field lots, winds and frost thinned the grain about one-third, causing the crop to ripen unevenly. All however did ripen, but the yield, though good, was less than if the seed had been sown the last of April, or early in May, and escaped the repeated winds and frosts that overtook the earlier-sown grain.

OATS—Test of Varieties.

Nineteen varieties were sown on the 11th of April, on fallowed land. Two bushels of seed was sown per acre. All were entirely killed by winds and frost, and were resown on the 16th of May, on other land, in plots of one-twentieth acre each.

Number of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	White Giant	Aug. 24	102	40	10	8	3,460	101	26	36·0
2	Twentieth Century	" 23	101	39	10	8	3,080	90	20	40·2
3	Wide Awake	" 24	102	39	10	7½	3,000	88	08	38·2
4	Virginia White	" 22	100	41	10	7	2,960	87	02	40·1
5	Victory	" 24	102	41	10	8	2,800	82	12	42·0
6	Thousand Dollar	" 23	101	38	10	7½	2,780	81	26	40·8
7	Irish Victor	" 23	101	39	10	7½	2,720	80	..	37·5
8	Abundance	" 20	98	38	10	8	2,700	79	14	36·0
9	Danish Island	" 22	100	39	10	8½	2,660	78	08	35·5
10	Banner	" 21	99	40	10	8	2,640	77	22	35·6
11	Golden Beauty	" 22	100	37	10	7	2,550	75	10	35·5
12	Lincoln	" 23	101	40	10	8	2,550	75	10	39·0
13	Improved American	" 24	102	39	10	8	2,520	74	04	35·0
14	Improved Ligowo	" 20	98	40	10	7½	2,520	74	04	39·0
15	Gold Rain	" 21	99	39	10	7½	2,360	69	14	39·4
16	Swedish Select	" 22	100	41	10	8	2,280	67	02	41·0
17	Siberian	" 23	101	41	10	8	2,140	62	32	40·0
18	'Regenerated' Abundance	" 20	98	39	10	8	1,900	55	30	36·0
19	Pioneer (black)	" 24	102	36	10	8	1,300	38	08	38·4

OATS—FIELD LOTS.

Six varieties were sown in field lots, from the 13th to the 26th of April. Regenerated Abundance was sown at the rate of four bushels per acre, the other varieties at the rate of two bushels per acre.

Improved Ligowo, Danish Island, and White Giant were injured by wind and frost severely, the others more or less. The land was fallowed in 1909.

OATS—Test of Varieties in Field Lots.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	'Regenerated' Abundance..	Aug. 5	107	42	10	8	3,107	91	13	42·8
2	Banner.........	" 18	114	39	10	8	3,065	90	05	41·1
3	Wide Awake.........	" 15	111	46	10	8	2,999	88	07	40·4
4	White Giant.........	" 16	125	45	10	8½	2,825	83	03	37·6
5	Improved Ligowo.........	" 15	116	41	10	7½	2,373	69	27	41·8
6	Danish Island.........	" 8	119	45	10	7½	2,357	69	11	37·4
7	Banner (Stubble).........	" 15	118	45	10	8	1,962	57	24	

OATS—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
'Regenerated' Abundance.........	Fallow.........	4	91	13	365	20
Banner.........	"	6½	90	05	586	26
Wide Awake.........	"	8	88	07	711	..
White Giant.........	"	7⅜	83	03	617	..
Improved Ligowo.........	"	5½	69	27	383	32
Banner	"	5½	69	26	383	28
Danish Island.........	"	5⅜	69	11	374	17
Banner.........	Stubble.........	2	57	12	114	24
		44⅛			3,537	11

An average of 86 bushels 13 lbs. per acre.

The average yield per acre and time taken to mature, of four varieties of oats grown in field lots under similar conditions for the past five years are shown below.

OATS—Five Years' Comparison of Field Lots.

Variety.	Average Days to Mature.	Average Yield per Acre.	
		Bush.	Lbs.
Wide Awake.........	115·6	88	02
White Giant.........	116·6	87	27
Banner.........	116·6	84	03
Danish Island.........	116	83	17

EXPERIMENTS WITH BARLEY.

The barley tests in uniform plots and in field lots were quite satisfactory.

The yield in nearly all varieties was good, and the quality better than for a good many years. The straw was not extra heavy, and gave no trouble in cutting. The land was summer-fallowed the previous year.

BARLEY—TEST OF VARIETIES.

Twelve varieties of six-row and ten varieties of two-row barley were sown on April 27, at the rate of two bushels seed per acre on plots of one-twentieth acre each.

All came up evenly and escaped the frost and wind to a large extent, or at least were not injured.

Six-Row Barley—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	O. A. C., No. 21....	Aug. 5..	100	38	10	2¾	3,340	69	28	46·5
2	Odessa............	" 9..	104	34	10	2½	3,340	69	28	49
3	Stella	" 8..	103	35	10	2¾	3,280	68	16	46·8
4	Manchurian........	" 8..	103	33	10	3	3,280	68	16	45
5	Trooper............	" 8..	103	33	10	2½	3,220	67	04	47·6
6	Mensury.	" 3..	98	34	10	2¾	3,180	66	12	46·7
7	Yale...............	" 8..	103	32	10	2½	3,140	65	20	49·2
8	Nugent	5 5..	100	36	10	3	3,020	62	44	46·6
9	Claude.............	July 30..	94	33	10	2¼	3,000	62	24	49
10	Mansfield....... ...	Aug. 3..	98	34	10	2½	3,000	62	24	47·8
11	Oderbruch	" 5..	100	32	10	3	2,900	60	20	51
12	Albert.............	" 3..	98	30	10	3¼	2,660	55	20	47·7

Two-Row Barley—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Hannchen..........	Aug. 9..	104	26	10	2¾	3,694	77	04	54·8
2	Danish Chevalier ...	" 11..	106	27	10	3½	3,380	70	20	54·2
3	Invincible..........	" 11..	106	24	10	2½	3,160	65	40	52
4	French Chevalier ...	" 19..	114	30	10	3½	3,000	62	24	51·5
5	Swedish Chevalier..	" 17..	112	31	10	3¾	3,000	62	24	51
6	Standwell	" 11..	106	28	10	2½	2,840	59	08	52·1
7	Clifford	" 9..	104	32	10	3	2,820	58	36	50·8
8	Jarvis	" 9..	104	32	10	3½	2,600	54	08	50·5
9	Canadian Thorpe. ..	" 11..	106	28	10	2½	2,480	51	32	48·1
10	Beaver.............	" 10..	105	28	10	3½	2,340	48	36	50·8

BARLEY—TEST OF VARIETIES IN FIELD LOTS.

Eight varieties were sown in field lots, on fallowed land on April 26 and 27. Two bushels of seed was sown per acre.

Barley—Test of Varieties in Field Lots.

No. of Plot.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Mansfield..........	Aug. 7..	102	38	10	2½	3,444	71	36	52·7
2	Mensury.	" 6..	102	44	10	2½	3,238	67	22	52
3	O. A. C., No. 1.....	" 8..	104	41	10	2¾	2,840	59	08	46
4	Manchurian	" 7..	102	41	10	3	2,614	54	22	51
5	Invincible	" 14..	109	37	10	3½	2,472	51	24	50·2
6	Standwell..........	" 15..	110	38	10	2½	2,405	50	05	53
7	Canadian Thorpe...	" 15.	109	36	10	2½	2,160	45	..	52·2
8	Hannchen.	" 9..	104	32	10	3	1,700	35	20	49·5

Barley—Average and Total Yields.

Variety.	Cultivation.	Acres in Field.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Mansfield	Fallow	2¾	71	36	197	15
Mensury	"	9	67	22	607	06
O.A.C. No. 21..........................	"	1	59	08	59	08
Manchurian............................	"	2	54	22	108	44
Invincible.	"	2	51	24	103	..
Standwell..............................	"	2	50	05	100	10
Canadian Thorpe.......................	"	2	45	..	90	..
Hannchen.............................	"	1	35	20	35	20
		21¾			1,301	07

An average of 59 bushels and 32 lbs. per acre.

BARLEY—FIVE YEARS' COMPARISON OF FIELD LOTS.

The average yield per acre and time taken to mature, of five varieties of barley grown in field lots under similar conditions for the past five years will be found below.

Variety.	Days to Mature.	Average Yield per Acre.	
		Bush.	Lbs.
Mensury	99·4	56	18
Mansfield	93·6	51	06
Invincible..	106·6	42	31
Standwell..	117·4	41	02
Canadian Thorpe..................................	105·0	40	21

EXPERIMENTS WITH FIELD PEAS.

TEST OF VARIETIES.

Peas were sown on root land, on which twelve loads of well-rotted manure was applied the fall before roots were sown. When the roots were taken off, the land was ploughed five inches deep and harrowed, and before the peas were sown in the spring it was ploughed shallow.

The peas were sown at the rate of two bushels for small, and three bushels for large sorts, per acre. All varieties were sown on April 11 and 12, the earliest date that peas have ever been put in here. Of all the crops grown, they suffered the least from wind and frost, as far as could be seen. The yield was below former years, but all ripened and were a good sample. Fourteen varieties were sown on 1/20 acre plots on April 11.

PEAS—Test of Varieties.

Number of Plot.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.
1	Mackay	Large	Aug. 6	117	60	2¾	2,420	40	20	64·5
2	Prussian Blue	Medium	" 5	116	54	3	2,300	38	20	64
3	Paragon	"	" 6	117	57	2½	2,300	38	20	63·2
4	Wisconsin Blue	Small	" 6	117	63	2½	2,200	36	40	65
5	Golden Vine	"	July 31	111	47	2	2,180	36	20	63·5
6	Picton	Medium	Aug. 5	116	59	2¼	2,120	35	20	65
7	Prince	Small	" 5	116	64	2¾	2,100	35	..	64·8
8	Gregory	Medium	" 3	114	54	2¼	1,960	32	40	64
9	White Marrowfat	Large	" 6	117	60	3¼	1,880	31	20	62·5
10	Daniel O'Rourke	Small	July 31	111	52	2¼	1,820	30	20	63·8
11	Chancellor	"	" 29	109	58	2½	1,720	28	40	63
12	Arthur	Large	Aug. 1	112	55	2¼	1,640	27	20	64·5
13	Black-eye Marrowfat	"	" 3	114	66	3¼	1,600	26	40	62·5
14	English Grey	"	July 28	108	64	2¼	1,560	26	..	61·5

PEAS—TEST OF FIELD LOTS.

Four varieties of peas were sown in this test on April 12. Golden Vine was also sown on fallowed land, resulting in very little difference in yield.

Number of Plot.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.
1	Archer	Medium	Aug. 7	117	57	2¼	2,500	41	40	64·6
2	Gregory	"	" 5	115	53	2¼	2,266	37	46	63·8
3	Golden Vine	Small	" 2	112	45	2	2,200	36	40	64·5
4	Golden Vine (Fallow)	"	" 2	112	46	2	2,168	36	08	64·5
5	Arthur	Large	" 2	112	57	2¼	1,466	24	26	64

SUMMARY OF CROPS, 1910.

	Bushels
Wheat—	
8 varieties, 45⅓ acres	1,813
Two 5½ acres, rotation test	408
13 uniform test plots	34
	2,255
Oats—	
6 varieties, 33⅓ acres	2,769
Two 5½ acres, rotation test	767
21 uniform test plots	80
	3,616
Barley—	
8 varieties, 21¾ acres	1,301
22 uniform test plots	68
	1,369
Peas—	
5 varieties, 6 acres	211
One 2⅛ acres, rotation test	77
14 uniform test plots	23
	311
Fall rye	20
Flax	18
Potatoes	125
Roots	2,000
	Tons.
Corn ensilage	108
Hay—	
Western Rye grass	20
Western Rye grass and Red clover	8
Alfalfa	17
Cut in coulées	10

FALL RYE.

Fall rye was sown on September 6, 1909, and as in all other years, gave a satisfactory yield. Farmers requiring early spring pasture, will find this the earliest crop that can be grown.

Size of Plot. Acres	Date Sown.	Date Ripe.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre. Bush.	Weight per Bushel. Lbs.
⅜	Sept. 6	July 21	70 ins.	8	4 ins.	50	57·7

FLAX EXPERIMENTS.

Six varieties of flax were sown in 1/20 acre plots on May 13. Just as they came above ground, a severe frost killed nine-tenths of all the plants, and all were ploughed up after it was certain that no recovery could be made. The varieties sown were: Common, White Flowering, Yellow Seeded, Riga, Improved Russian, Dutch.

Two acres of Dutch flax was sown on May 14. Like the smaller plots, this was badly frozen, and was ploughed up.

One acre was sown on May 23, and one-half acre on June 6. A large part of both plots was pulled for exhibition purposes, and no record was kept of the yield of the remainder.

SMUT TESTS.

Two plots (1/20 acre each) of smutty Huron wheat were sown, one plot being treated with formalin, which clearly shows the necessity of treating for smut.

Remarks.	Yield per Acre.	
	Bush.	Lbs
Treated, 1 lb. Formalin in 30 gals. water. Free from smut........................	54	40
Untreated. Unsaleable........	47	..

Two plots of Mensury barley were sown,, one plot being treated the same as wheat, and the other plot not treated. No smut was found in either plot.

SOIL PACKING TESTS WITH BARLEY.

Three plots of Mensury barley were used, one plot was packed once, another twice, and the third was not packed. The land had been fallowed and no cultivation done in the spring, before or after seeding. A subsurface packer was used.

——	Sown.	Ripe.	Yield.	
			Bush.	Lbs.
1st plot, packed once..	April 27	Aug. 3	69	28
2nd plot, packed twice..........	" 27	July 30	68	16
3rd plot, not packed..........	" 27	Aug. 4	64	28

SOIL PACKING TEST WITH OATS.

Two plots of Banner oats were used, one plot was packed once, and the other plot was not packed. The land had been fallowed, and no cultivation done in the spring, before or after seeding.

	Sown.	Ripe.	Yield.	
			Bush.	Lbs.
1st plot, packed	April 19	15	88	17
2nd plot, not packed	" 19	17	81	21

SOIL PACKING TEST WITH PEAS.

One acre of Golden Vine peas was packed with the subsurface packer once, as the crop was coming up. The acre was also harrowed with the ordinary iron harrow before the packing was done.

One acre was not packed, but was harrowed as the peas came above ground, resulting in the unpacked acre giving 1 bushel 32 lbs. more than the one that was packed.

CROP ROTATIONS.

Last spring a field of 49½ acres was laid out in nine fields of 5½ acres each, and the following rotations started:—

FIRST SERIES.

Field No. 1, summer-fallow. No. 2, hoed crop and legume, manure 15 tons per acre. No. 3, wheat. No. 4, oats. No. 5, fallow. No. 6, wheat. No. 7, oats, seeded with Rye grass and alfalfa. No. 8, hay. No. 9, pasture.

SECOND SERIES.

This spring the second series of rotation tests will be commenced in a field of 48 acres laid out in eight fields of 6 acres each.

The field was in pasture when broken up last year.

Order of Rotation.

Field No. 1, summer-fallow. No. 2, wheat. No. 3, wheat. No. 4, fallow. No. 5, roots or legume, 15 tons of manure to the acre. No. 6, barley seeded to Rye grass, Red clover and alfalfa. No. 7, hay. No. 8, pasture.

THIRD SERIES.

A field of 42 acres will be prepared, laid out in six equal divisions, and prepared for the following rotations:—

Field No. 1, summer-fallow. No. 2, wheat. No. 3, wheat.. No. 4, oats, seeded with Rye grass, Red clover and alfalfa. No. 5, hay. No. 6, pasture.

ROTATION TESTS, 1910.

Number.	Variety.	Character of Soil.	Date Sown.	Date. Ripe.	Days Maturing.	Length of Straw including Head.	Strength of Straw on a scale of ten points.	Length of Head.	Yield per Acre.	
						Inches.			Bush.	Lbs.
1	Fallow	Fallow....	....	....	......	......	....	......	......	......
2	Hoed crop..........	" ..	....	....	......	......	....	......	......	......
3	Preston Wheat......	" ..	April 8	Aug. 8	122	42	10	3¼	41	11
4	Imp. Ligowo Oats..	" ..	" 21	" 15	116	41	10	7½	69	27
5	Fallow	" ..	....	....	......	......	....	......	......	......
6	Huron Wheat......	" ..	April 8	Aug. 8	122	41	10	3	33	11
7	Banner Oats.	" ..	" 21	" 17	118	41	10	7½	69	26
8	Grass seeds.........	" ..	....	....	......	......	....	......	......	......
9	Grass seeds.........	" ..	....	....	......	......	....	......	......	......

ALFALFA.

Three strains of alfalfa were sown in 1904, nine strains in 1905, six strains in 1908, and thirty-nine strains in 1909. Those living last spring and producing crops are given, with yields. The first cutting in all cases was fairly good. A few varieties of the 1909 seeding gave extra large yields, chiefly from being in low places where the soil was more moist than in the other cases. The second cutting in all varieties was light, on account of the protracted dry hot weather after the first cutting was made.

I repeat what was said in my 1910 report respecting alfalfa growing, and add a few pointers as to the most suitable land, cultivation, seeding, cutting, curing, etc.

It is found from previous tests that a great deal depends on the first season's growth, whether alfalfa prove hardy or not. If it enters the winter with small roots, and the top has been eaten bare, it is sure to succumb. On the other hand, if the roots have taken a good hold, and a good growth has been left to protect the crown, the crop is reasonably safe. If added to this, the precaution is taken not to pasture too closely or too late in the fall, there is no reason to doubt of its entire success. The course pursued on this Farm which has given the best result is, to plough stubble land late in May, four or five inches deep; then harrow once. After harrowing, ten to twelve lbs. seed per acre is sown with a wheelbarrow grass seeder. When sown, the land is harrowed, rolled and again harrowed. The rolling firms the soil, and leaves the surface in good condition for the mower, and the last harrowing prevents evaporation.

The seed is sown without a nurse crop, and when the plants are sufficiently high, the mower is run close to the ground, to kill weeds and cause the roots to take a better hold. This is repeated up to the end of July, and after that all growth is left for winter protection.

It has been found, when a nurse crop has been grown, that the plants are weakly, even if not badly killed out by the grain using up all the moisture in August. If they survive after the grain is harvested, as a rule the weather is too dry for them to make satisfactory root or top growth, and they are not in a condition to stand the thaws and frosts of April and early May.

CULTIVATION, SEEDING AND HARVESTING OF ALFALFA.

Alfalfa can be sown on fallowed land or on stubble land.

Fallow.—If fallow lands drift with the winds, plough four inches deep before seeding to overcome the danger.

Indian Head, 1908.- Two row Barley.

Stubble.—If stubble is heavy, burn in the spring, plough five inches deep and harrow. If land was ploughed the preceding fall, cultivate before sowing.

Seeding.—Sow 12 lbs. of seed per acre, from May 25 to 31. After seeding, cross-harrow twice then roll or pack soil; do not roll fallowed land, use packer instead.

Nurse crop.—On fallowed land, grain can be sown; oats or barley is better than wheat, as these can be delayed in seeding. Alfalfa seed should not be sown too early. On stubble land, no nurse crop should be sown, as usually the moisture is not sufficient for both and the tender clover plants die.

When clover is up about five inches, mow close to the ground, and repeat the first week in August.

Leave the last growth uncut for winter protection. The mowing kills weeds and strengthens the roots, which is important the first winter.

Harvesting.—Alfalfa is usually ready for the first cutting early in July, and for the second cutting, the same time in August of the second year. Cut when in blossom. Cut early in the forenoon, and if the day is fine, rake into windrows in the afternoon, and put into small cocks the next day.

Allow the hay to cure in the cocks; turning and exposing to the air will hasten drying.

Have the hay well dried before stacking, for fear of spoiling.

ALFALFA, Sown 1904.

Variety.	Remarks.	Date Cut.	Yield per Acre.	
			Tons.	Lbs.
Turkestan	Strong	July 8	1	600
Common Alfalfa	"	" 8	1	1,080

ALFALFA, Sown 1905.

Variety.	Remarks.	Date Cut.	Yield per Acre.	
			Tons.	Lbs.
Grimm	Strong	July 8	2	400
New York	"	" 8	2	100
Samarkand (Turkestan)	"	" 8	1	1,575
Nebraska	"	" 8	1	880

ALFALFA, Sown in 1908.

Variety.	Remarks.	Date Cut.	Yield per Acre.	
			Tons.	Lbs.
Grimm (Lyman Co)	Strong	July 8	1	1,420
Idaho	"	" 8	1	1,330
Montana, (Lyman Co.)	"	" 8	1	1,600
Dryland, (Lyman Co.)	"	" 8	1	1,600
French Alfalfa	"	" 8	1	1,600
Turkestan, (Lyman Co.)	"	" 8	1	1,390

ALFALFA—Sown in 1909.

Variety.	Remarks.	Date Cut.	Yield per Acre. Tons.	Lbs.
Canadian	Strong	July 11	2	1,790
Vilmorin's Sand Lucerne	"	" 11	2	825
Lecoq's " "	"	" 11	2	825
Mongolian	"	" 11	3	1,740
Nephi, Utah (dry land)	12 p.c. killed	" 11	2	1,805
Sextorp, Neb	Strong	" 11	2	837
Alt-Deutsche Fränkische	"	" 11	2	1,872
Provence-Aubignan	8 p. c. dead	" 11	1	903
Wessel, Duval Peruvian	Winter killed.			
Baltic	Strong	" 11	1	1,870
Werney or Tschilik (Turkestan)	"	" 9	3	1,740
Sand Lucerne, (Darmstadt)	"	" 9	3	1,740
Chinook, Montana	"	" 9	3	1,740
Liefman's Sand Lucerne	"	" 9	2	1,805
Arabian	Killed by spring frosts.			
Medicago ruthenica	10 p. c. killed	" 9	1	1,870
Medicago falcata	Strong	" 9	2	1,805
Sand Lucerne, Bromberg	"	" 9	6	577
Thuringian, Erfurt (Germany)	"	" 9	5	642
Sand Lucerne, (Wissinger)	"	" 9	5	1,610
Hungarian, Boschau (Vienna)	"	" 9	5	1,610
Pfalzer (Bavarian)	"	" 9	5	1,610
Frasinet (Roumania)	4 p. c. killed	" 9	3	1,740
Vasluiu, (Roumania)	5 p. c. killed	" 9	2	1,805
Belfontaine (Ohio)	Strong	" 9	5	755
Mixed Seed	"	" 9	5	642
Old Frankish Lucerne	"	" 9	3	1,740
W. A. Wheeler, No. 162	"	" 9	2	1,500
No. 240	"	" 9	2	1,500
No. 164	"	" 9	2	450
No. 167	"	" 9	2	1,625
Grimm (A. B. Lyman Co.)	"	" 9	2	375
Montana (23454)	5 p. c. dead	" 9	1	1,600
Grimm (25102)	Strong	" 9	2	80
Sand Lucerne (23394)	"	" 9	1	1,360
Canadian, variegated (24837)	"	" 9	1	1,800
Canadian, purple flowered (24837)	"	" 9	2	125
Turkestan	"	" 9	1	1,750
Sainfoin (Spanish)	Entirely winter killed.			
Grimm	Strong	" 9	2	......
Turkestan	"	" 9	1	1,720
Mixed varieties	"	" 9	2	40

TEST OF SOWING ALFALFA ON DIFFERENT DATES.

Three two-acre lots of alfalfa were sown in the spring of 1909, the first lot in the last of May, the second lot on July 10, and the third lot on August 18. The variety was Montana, and each lot was sown without a nurse crop.

The first plot, sown the last week in May, was mown twice by August 1, and the last growth left for winter protection.

The second plot was mown once early in August and the last growth left. The third plot was mown, but as the alfalfa growth was short, the mowing was more for the purpose of killing weeds.

In the spring of 1910, the third plot was entirely dead, the second plot was also dead in low places. Both plots were ploughed up and resown early in May. The first plot came through in good condition, giving 2 tons 400 lbs. per acre.

GRASSES AND RED CLOVER.

The hay crop was light, but the weather being favourable when cut, was secured in good condition.

Variety.	Year Sown.	Date Cut.	Yield per Acre.
			Tons. Lbs.
Western Rye Grass	1906	July 8...	1 ...
Western Rye Grass and Red Clover	1906	" 13...	1 100
Western Rye Grass, Red Clover and Timothy	1907	" 13...	1 500
Brome Grass	1899	" 13...	.. 1,970

EXPERIMENTS WITH INDIAN CORN.

Ten varieties of Indian corn were sown in drills thirty-five inches apart, and planted in hills three feet apart each way. The land had been fallowed the previous year. No manure was applied.

Up to August 15, the promise was not good for a satisfactory return, but heavy rains after that date, with warm weather, made a great improvement, and when cut on September 7, a good yield in all cases was obtained. No frost injured the crop from sowing to cutting.

The corn was sown with the grain drill, by closing up enough cups to make the rows as nearly thirty-six inches apart as possible. The farm drill is a seven-inch, causing the rows to be thirty-five inches apart. The corn was sown two inches deep. The yield was computed from the weight of two rows, each sixty-six feet long.

INDIAN CORN FOR ENSILAGE—Test of Varieties.

No. of Plot.	Name of Variety.	Date of Sowing.	Date of Cutting.	Average Height.	Condition when Cut.	Weight per Acre Grown in Rows.	Weight per Acre Grown in Hills.
				Inches.		Tons. Lbs.	Tons. Lbs.
1	Eureka	May 25.	Sept. 7.	86	Tasselled	29 1,400	26 1,460
2	Champion White Pearl	" 25.	" 7.	90	"	27 1,044	22 880
3	Salzer's All Gold	" 25.	" 7.	80	"	24 1,104	24 180
4	Selected Leaming	" 25.	" 7.	88	"	21 184	20 920
5	Wood's Northern Dent	" 25.	" 7.	88	"	24 180	23 200
6	Angel of Midnight	" 25.	" 7.	78	"	23 1,520	19 1,600
7	Compton's Early	" 25.	" 7.	84	Not tasselled	23 200	19 1,600
8	Northwestern Dent	" 25.	" 7.	80	In cob	22 1,540	19 1,600
9	Longfellow	" 25.	" 7.	78	Not tasselled	22 220	19 1,600
10	Superior Fodder	" 25.	" 7.	88	"	20 656	20 920

FIELD ROOTS.

Turnips, mangles, sugar beets and carrots were sown on fallowed land. The land was ploughed in June, seven inches deep, cultivated three times during the growing season, and ploughed five inches deep in October, and twelve loads of well-rotted manure applied per acre.

In the spring before the frost was out of the soil, the land was harrowed, which helped to scatter the manure. A few days before sowing the root seed, the land was gang-ploughed shallow and harrowed.

The seed was sown on the flat, turnips, mangels and sugar beets on two separate dates, and carrots once. When up sufficiently high, the plants were thinned to twelve inches apart in the rows, rows twenty-seven inches apart. Heavy raing in August insured a large crop of turnips and mangels.

TURNIPS—Test of Varieties.

No. of Plot.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 2nd Sowing.		Yield per Acre. — 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Mammoth Clyde	33	1,188	1,119	48	27	1,308	921	48
2	Hall's Westbury	31	1,624	1,060	24	28	1,024	950	24
3	Hartley's Bronze	29	1,532	992	12	26	536	875	36
4	Jumbo	29	608	976	48	22	1,936	765	36
5	Perfection Swede	29	80	968	..	23	200	770	..
6	Magnum Bonum	28	760	946	..	24	1,500	825	..
7	Halewood's Bronze Top	25	1,216	853	36	23	728	875	36
8	Good Luck	25	556	842	36	28	1,420	957	..
9	Carter's Elephant	21	1,164	719	24	24	1,104	818	24
10	Bangholm Selected	19	544	642	24	22	1,804	763	24

MANGELS—Test of Varieties.

Number of Plot.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 2nd Sowing.		Yield per Acre. — 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Intermediate	31	1,624	1,060	24	23	1,388	789	48
2	Half Sugar White	29	1,796	996	36	24	576	809	36
3	Giant Yellow Globe	28	1,156	952	36	26	140	869	..
4	Gate Post	26	1,196	886	36	19	1,732	662	12
5	Selected Yellow Globe	26	1,196	886	36	27	252	904	12
6	Prize Mammoth Long Red	26	536	875	36	24	1,368	822	48
7	Perfection Mammoth Long Red	23	464	774	24	21	768	712	48
8	Yellow Intermediate	22	1,276	754	36	17	1,036	583	56

CARROTS—Test of Varieties.

Number of Plot.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.	
		Tons.	Lbs.	Bush.	Lbs.
1	Mammoth White Intermediate	12	420	407	1
2	White Belgian	11	440	374	2
3	Half Long Chantenay	9	1,668	327	48
4	Ontario Champion	9	1,536	325	36
5	Improved Short White	8	104	268	24

SUGAR BEETS—Test of Varieties.

Number of Plot.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 2nd Sowing.		Yield per Acre. — 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	French Very Rich	15	228	503	48	13	1,192	453	12
2	Klein Wanzleben	14	1,700	495	..	13	928	432	8
3	Vilmorin's Improved	14	116	468	36	13	928	432	8

POTATOES.

The potato crop was very satisfactory both in quantity and quality. Rather more small tubers were produced than in ordinary years.

The potato bug made its first appearance on the Farm and in the district last year. They however came too late to do much injury, but will no doubt give more trouble after this.

The yield per acre in each case was computed from two rows, each sixty-six feet long. The land was a clay loam fallowed the same as root land, but no manure was applied.

The rows were thirty inches apart, with the sets planted fourteen inches apart. Before the sets were cut, the potatoes were soaked in a solution of 1½ lbs. formalin in 35 gallons of water, for two hours, for the prevention of scab. While not entirely effectual, it was fairly so.

All varieties were planted on May 11, and dug September 26.

POTATOES—Test of Varieties.

Number.	Variety.	Growth.	Size.	Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Form and Colour.
				Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Reeves' Rose	Strong	Medium	622	36	576	24	46	12	Oval, red.
2	Everett	"	Large	607	12	567	36	39	36	Long, pink.
3	Morgan Seedling	"	"	580	48	545	36	35	12	" "
4	Late Puritan	"	"	558	48	508	12	50	36	Oval, white.
5	Money Maker	"	"	554	24	510	24	44	..	Long, white.
6	Carman No. 1	"	Medium	545	36	499	24	46	12	Round, white.
7	Gold Coin	"	Large	545	36	503	48	41	48	Oval, white.
8	Empire State	"	Medium	543	44	492	48	50	36	Round, white.
9	Rochester Rose	"	"	543	24	499	24	44	..	Oval, red.
10	Irish Cobbler	"	"	484	..	442	12	41	48	Round, white.
11	Vick's Extra Early	"	Large	479	36	442	12	37	24	Oval, pink.
12	Ashleaf Kidney	"	"	464	12	413	36	50	36	Round, white.
13	Dreer's Standard	"	"	455	24	409	12	46	12	Oval, white.
14	Dalmeny Beauty	"	"	437	48	389	24	48	24	" "
15	Hard-to-Beat	Medium	Medium	427	54	381	42	46	12	Oval, pink.
16	Factor	"	"	421	25	369	36	51	49	" "
17	American Wonder	Strong	"	371	48	321	12	50	36	Long, white.

THE VEGETABLE GARDEN.

Vegetables were all good but were not a large crop. Frosts in May destroyed any tender sorts that were planted too early. Tomatoes were cut down. The dry, hot weather in July was much against a rapid growth. Heavy rains in the latter part of August made a decided improvement in most of the varieties.

ASPARAGUS.

A good crop was obtained from the old beds of Barr's Mammoth, Barr's Elmira, and Conover's Colossal. In use from May 7 to July 4.

BEANS—Sown in Garden May 23.

Variety.	Seed from.	In Use.	Pulled.	Remarks
Dwarf Kidney	Indian Head.	July 23	Sept. 12	Good crop
Dwarf Extra Early	"	" 22	" 1	Medium crop.
White Field	"	Aug. 4	" 17	Good crop.
Haricot Matchless	"	July 28	" 10	"
Emperor of Russia	"	" 26	" 12	"
Fame of Vitry	"	" 28	" 24	Extra good.
Bush, Green Pod	"	" 25	" 19	Good crop.
Dwarf Matchless	"	" 30	" 10	"
French Extra Early	"	" 23	" 2	Medium wax.
Challenge Black Wax	"	" 21	" 2	Large pod.
French Unrivalled	"	" 22	" 10	Good crop.
Black Speckled	"	Aug. 2	" 17	Long green.
Bush Butter, xxx	"	July 26	" 16	Extra good.
Dwarf Extra Early	"	" 22	" 2	Medium crop.
Early Six Weeks	"	" 20	" 10	Long green.
Extra Early	"	" 22	" 10	Green.
Honey Pod	"	" 25	" 17	Good crop.
Haricot Extra Early		" 25	" 2	Long wax.
King of the Skinless	"	Aug. 8		Did not ripen.

BEETS—Sown April 29, Pulled October 10.

Variety.	In Use.	Yield per Acre. Bush.	Yield per Acre. Lbs.
Eclipse	July 21	1,033	20
Crosby's Egyptian	" 21	1,000	..
Early Flat Egyptian	" 21	1,016	40
Crimson Globe	" 21	1,066	40
Brigg's Extra Early	" 21	1,283	20
Egyptian Extra Early	" 21	1,016	40
Nutting's Dwarf Red	" 21	1,066	40
Blood Red Turnip	" 21	1,082	40
Egyptian Extra Early	" 21	800	..

CABBAGE—Sown in hothouse March 18; set out May 23; taken up October 11.

Variety.	In Use.	Average Weight.	Remarks.
		Lbs.	
Autumn King	Aug. 25	16	Large and solid.
Chester King	" 14	17	"
Surehead	" 9	14	"
Early Jersey Wakefield	" 1	12	"
Mammoth Red Rock	Sept. 4	10	Solid heads.
World Beater	Aug. 14	17	Large and solid.
Early Paris Market	July 22	10	Medium, solid.

CABBAGE—Sown in hothouse April 5; set out May 30; taken up October 11.

Variety.	In Use.	Average Weight.	Remarks.
		Lbs.	
All Seasons	Aug. 9	17	Large, solid.
All Head	" 5	17	"
Large Flat Dutch	" 18	16	"
Early Savory	July 22	9	Medium, solid.

CITRONS.

Colorado Mammoth, and a variety received from the Central Experimental Farm, were sown in the hothouse on March 19; set out in the garden on May 26; a good crop, average weight, 12 lbs.

MELONS—Sown in the hothouse, March 19; set out, May 26.

Variety.	Weight.	Remarks.
	Lbs.	
Cole's Early	5	Did not ripen.
Table Melon	5	"

RHUBARB.

Old beds in use from May 20 up to August 25; made a good growth during the season. The following varieties were grown:—

Myatt Linnaeus.
Fottler's Improved.
Scarlet Nonpareil.
Victoria.
Royal Linnaeus.
Strawberry.
Prince Albert.

CELERY.

Planted June 9, in trenches 18 inches deep, with 6 inches of manure in the bottom, and 4 inches of soil on top of manure. The celery was given three good waterings during the season.

Variety.	Sown in Hot-house.	Set Out.	In Use.	Weight per Dozen Heads.
				Lbs.
White Plume	Mar. 18	Apr. 25	Aug. 25	18
Dwarf White Salad	" 18	" 25	Sept. 4	17
Rennie's Self Blanching	" 18	May 4	Aug. 25	12
Giant Pascal, C.E.F.	Apr. 5	" 4	Sept. 18	19
Rose-ribbed	" 5	" 4	" 14	14
Paris Golden Yellow	" 5	" 4	" 14	10
Solid Pascal	" 5	" 4	" 18	17
Giant Pascal	" 5	" 4	" 18	19

CAULIFLOWER—Sown in hothouse, March 18; set out, May 30.

Some heads of Autumn Giant were pulled before heading and put in the cellar in three inches of soil, and gave cauliflower at and after the New Year.

Variety.	In Use.	Average Weight.	Remarks.
		Lbs.	
Early Snowball	July 19	6	Good.
Extra Early Erfurt	" 23	6	"
Earliest Snowball	" 19	5	Medium.
Lend's Short Stem	" 29	4	"
Early Snowball	" 29	5	Good.
Autumn Giant	Sept. 4	10	Very fine heads.

CARROTS—Sown April 2; pulled September 29.

Variety.	In Use.	Yield per Acre.		Remarks.
		Bush.	Lbs.	
Stensball	July 11	400	..	Very good.
Half-Long Nantes	" 5	383	20	"
Half-Long Danvers	" 8	350	..	"
Half-Long Chantenay	" 12	350	..	"

CUCUMBERS—Sown in hothouse, March 19; set out, May 26.

Variety.	In Use.	Ripe.	Length.	Remarks.
			Inches.	
New Davis	Aug. 4	Aug. 30	8	Good crop.
Prize Pickling	July 29	" 22	8	"
Giant Pera	" 22	" 20	10	Fair crop.
Short Green	" 18	" 17	7	Good crop.

CORN—Sown, May 25.

Variety.	In Use.	Date Ripe.	Remarks.
Rennie's XXX			Did not mature.
Early Cory, White Cob			"
White Squaw	Aug. 9	Sept. 1	Good crop.
Red Squaw	" 8	" 1	"
Early Adams	Sept. 5		Did not ripen.
Malakoff	" 1		"

GARDEN PEAS.

Variety.	Date Sown.	In Use.	Date Ripe.	Remarks.
Stratagem	April 13	July 25	August 25	Splendid crop.
Admiral	" 13	" 13	" 25	"
Yorkshire	" 13	" 14	" 8	"
Nott's Excelsior	" 13	" 12	" 15	"
Leviathan, Extra Early	" 13	" 8	" 13	"
Burpee's Profusion	" 13	" 18	" 5	"
Surprise	" 13	" 11	" 19	"
Anticipation	" 13	" 18	" 10	"
Gradus	" 13	" 6	" 19	"
Shropshire Hero	" 13	" 17	" 16	"
Perfection	" 13	" 21	" 19	"
Dwarf Telephone	" 13	" 20	" 20	"
Western Beauty	" 13	" 14	" 13	"
Rennie's Queen	" 13	" 21	" 15	"
Horsford's Market Garden	" 13	" 16	" 9	"
Laxton's Charmer	" 13	" 16	" 10	"
Queen	" 13	" 23	" 17	"
American Wonder	" 13	" 17	" 9	"
Alaska	" 13	" 9	" 5	"

ONIONS—Sown in hothouse, March 26; transplanted in garden, May 17; taken up, September 5.

Variety.	Bushels per Acre.	Remarks.
Red Wethersfield	132·20	Medium crop.
Prize Taker	130	Good "
Australian Brown	102	" "
Southport Red Globe	133	Medium "
Silverskin	66	" "

ONION SETS—Planted in garden, April 16; taken up, September 5.

Variety.	Bushels per Acre.	Remarks.
White Multiplier	83	Fair crop, medium quality.
French Shallot	75	" " " "
Potato Onion	86·40	" " " "

ONIONS—Sown in garden, April 2; taken up September 5.

Variety.	Bushels per Acre.	Remarks.
Red Wethersfield	100	Fair crop, good quality.
Prize Taker, Red Globe	105	" " " "
Australian Brown	83·20	" " " "
Southport Red Globe	100·40	" " " "
Silverskin	40	" " " "

PARSLEY.—Sown in garden, April 18; in use, July 8; pulled, September 30. Variety—Extra Curled, good crop.

SPINACH.—Sown in garden, May 9; in use, July 3. Good crop. Varieties—Broomsdale and Victoria.

PUMPKINS—Sown in hothouse, March 19; transplanted in garden, May 26.

Variety.	Date Ripe.	Remarks.
Jumbo Mammoth	Sept. 12	Medium crop, good size.
Connecticut Field	" 12	Good crop, fair size.
Etampes	" 12	" " " "

SQUASH—Sown in hothouse, March 19; transplanted in garden, May 25.

Variety.	In Use.	Weight.	Remarks.
Hubbard Squash	Aug. 16	18 Lbs.	Medium crop, good size.
Mammoth Yellow	" 12	15 "	" " fair "
Custard	" 8	6 "	" " " "
Early Orange	" 4	40 "	Small crop, very large.
Bush Marrow	" 10	9 "	Medium crop, good size.
Yellow Fleshed	" 2	35 "	Fair crop, good size.
Mammoth Whale	" 14	17 "	" " " "

RADISH—Sown in garden, April 2.

Variety.	In Use.	Remarks.
White Icicle	June 17	Large, white.
Olive Scarlet	" "	Large, fine.
White Tipped	" "	Very good.
Winter Black	" "	Large, good crop.

TOMATOES.

Sown in boxes in hothouse, March 1 and April 18. Frost caught the March 1 plants when set out, and the ones sown on April 18 were set out in the garden on May 25. The yield is the number of pounds of fruit, both green and ripe, taken on September 15, from two plants of each variety set three feet apart.

Variety.	First Ripe.	Yield of Two Plants.
		Lbs.
Early Jewel	August 17	18
Livingston's Globe	" 22	20
New Earliana	" 14	28
Early Ruby	" 17	23
Earliana, C.E.F	" 14	25

LETTUCE.

First seeding, April 2; second seeding, May 9; third seeding, May 24. First seeding in use, June 4. Second seeding in use, July 11. Third seeding in use, July 21.

Variety.	Remarks.
First seeding—	
May King	Good heads.
Grand Rapids	Fair heads.
Cos Trianon	Fair heads.
Second seeding—	
Red-Edged Victoria	Good heads.
Unrivalled Sommer	Good heads.
Grand Rapids	Fair heads.
Cos Trianon	Large heads.
Third seeding—	
Red-Edged Victoria	Fair heads.
May King	Good heads.
Grand Rapids	Medium heads.
Cos Trianon	Medium heads.

PARSNIP—Sown April 22.

Variety.	In Use.	Yield per Acre.
		Bush.
Hollow Crown	August 10	303
Guernsey	" 10	300

SAGE—Sown April 18; ready for use, July 1. Fair crop.

SAVORY—Sown May 9; ready for use, July 1. Good crop.

PEPPERS—Sown in hothouse, March 21; transplanted, June 8. Cut down by frost before ripening. Variety—Chinese Giant.

CRESS—Sown, May 9. In use, June 4. Variety—Extra Curled.

THE FLOWER GARDEN.

Annual flowers had a longer period of bloom than usual, asters alone doing poorly, which was generally the case with them wherever grown.

The ground was deeply dug over in the fall, and well-rotted manure dug in and before planting, it was loosened on top. The perennial flower beds were dug over in the spring, as deeply as the roots would permit, a good coating of manure being applied.

Each fall, all tops are removed and a covering of coarse manure put on for winter protection.

ANNUALS—Sown in hothouse, March 18, 26, and 31. Set out June 6, 7, 8.

Variety.	In Bloom.	
	From	To
Asters, 11 varieties	July 25	Oct. 11.
Balsam	June 18	Sept. 12.
Clarkia	" 20.	" 12.
Coreopsis	" 20.	" 12.
Celosia	July 25	" 12.
Candytuft	June 4.	Oct. 11.
Carnation	Aug. 25	" 11.
Dianthus	July 2	" 11.
Centaurea	Did not bloom.	
Canterbury Bell	" "	
Castor Bean	" "	
Columbine	" "	
Chrysanthemum	June 19	Oct. 11.
Datura	Sept. 12	" 11.
Gaillardia	July 3	Sept. 24.
Godetia	" 8	" 24.
Linum	June 24	" 20.
Mignonette	" 16.	" 28.
Nasturtium	" 28.	" 15.
Monkey Flower	" 28.	" 10.
Nicotiana affinis	" 29.	Oct. 12.
Petunias, C. E. F., (3 varieties)	" 20.	Sept. 15.
Papaver	" 23.	" 15.
Phlox	" 28.	July 28.
Poppy	" 28.	" 28.
Sweet Peas (27 colours)	July 20	Oct. 15.
Sweet Marguerite	" 20	Sept. 22.
Scabiosa	Did not bloom.	
Salpiglossis	July 24	Sept. 15.
Sunflower	" 24	Aug. 20.
Tagetes	June 23	Oct. 12.
Verbena	" 29.	" 12.
Alyssum	" 10.	" 11.
Antirrhinum	" 28.	Sept. 25.
Ageratum	" 20.	Aug. 25.

ANNUALS—Sown in the open, April 30.

Variety.	In Bloom.	
	From	To
Abronia	July 14	Sept. 30.
Barton a..	" 14	"
Brachycome	" 4	"
Clarkia	" 6	"
Coreopsis	" 8	"
Calendula	" 14	"
Eschscholtzia	" 28	"
Helichrysum	" 15	"
Godetia	" 17	"
Lobelia	" 10	"
Mignonette	" 8	"
Pansies	" 6	"
Scabiosa	Aug. 15	"
Salpiglossis	July 19	"
Chrysanthemum	" 19	"
Nasturtium	" 12	"
Scabiosa major	" 12	
Nasturtium, (Tom Thumb)	" 12	"
Nemesia strumosa	Aug. 3	"

PERENNIALS—PLANTED IN SPRING OF 1910.

The following bulbs were received from the Central Experimental Farm, Ottawa, and set out early in April.

H. Wendland,
Florence Vaughan,
Comte Horace de Choiseul,
J. D. Eisele,
King Humbert,
Louisiana,
Indiana,
Venus,
Yellow Crozy,
Fair Hope,
Miss Berthine Brunner,
America,
New York,
Mrs. Kate Grey,
The Express,
Duke of Marlboro,
Captain Druyon,
Inglewood,
Rubin,
Mrs. Geo. A. Strohlein,
Allemania,
Leonard Vaughan,
Secretaire Chabanne,
Queen Charlotte,
Jupiter,
Pennsylvania,
William Saunders,
Wyoming.

Dahlias.

Prince Imperial,
Mrs. Leopold Seymouss,
Gabriel,
Matchless,
Austin Connell,
Earl of Pembroke,
Empress of India,
Cycle,
Ernest Glasse,
Flossie,
Connell's Gem,
Lady H. Grosvenor,
Capstan,
Standard Bearer,
Miss Annie Jones,
Mrs. Chas. Turner,

Louis Hariot,
Kingfisher,
Gloriosa,
Eureka,
Pendant,
Bon Ton,
Winsome,
Sylvia,
Kynerith,
Miss Fuich,
A. D. Levone,
Rosenhagen,
Evadne,
Island Queen,
Blue Oban,
Mrs. E. Gladstone,
Catharine Duen.

PERENNIALS.

Variety.	In Bloom.		Remarks.
	From	To	
Tulips	April 25	May 25	Poor.
Snowdrops	Did not bloom		
Crocus	" "		
Iris	May 25	July 1	Fair.
Pæonies	June 24	" 20	Good.
Everlasting Pea	" 20	Aug. 20	"
Bleeding Heart	" 14	July 28	"
Yarrow	" 24	" 10	"
Hemerocallis	July 8	" 30	"
Sidalcea	June 28	Aug. 1	"
Achillea	" 28	" 25	Fair.
Helianthus	July 20	Sept. 12	"
Columbine	June 11	July 21	Good.
Lychnis	" 25	Aug. 4	"
Sweet William	" 20	" 9	"
Clematis Recta	" 25	" 1	"
Delphinum	" 28	" 30	"
Oriental Poppy	" 26	July 10	"
Phlox	Aug. 11	Sept. 17	"
Golden Glow	" 6	" 14	"
Blue Squill	April 7	April 21	"
Shasta Daisy	June 29	Aug. 12	"
Veronica spicata	July 6	Sept. 2	"
Lupinus polyphyllus	" 8	Aug. 5	"
Canterbury Bell	" 1	" 25	"

BULBS PLANTED IN FALL OF 1910.

Twenty-four varieties of Tulips and Narcissus, were received from the Central Experimental Farm, Ottawa, and planted on September 28.

ROSES.

The following list of roses were received from the Experimental Farm, Ottawa, and planted in the garden on April 28. Of these La France, Magna Charta, Mrs. R. C. Sharman Crawford, Frau Karl Druschke, Capt. Hayward, Mrs. John Laing, and Margaret Dickson, came to bloom; the last two named were exceptionally fine, and bloomed until the heavy frosts came in October. All were deeply covered with manure when frost set in.

Baroness Rothschild,
Captain Hayward,
Charles Lefebvre,
Killarney,
Earl of Dufferin,
Fisher Holmes,
Frau Carl Druschki,
General Jacqueminot,
John Hopper,
La France,
Mme. Gabriel Luizet,
Magna Charta,
Margaret Dickson,
Merveille de Lyon,
Mrs. John Laing,
Mrs. R. G. Sharman Crawford,
Paul Neyron,
Ulrich Brunner,
Persian Yellow,
Crimson Rambler,
Dorothy Perkins.

SMALL FRUITS.

The following varieties of Small Fruits are grown on the Farm at present.

RED CURRANTS.

Victoria Red,
New Dutch,
Long Bunch Holland,
La Conde,
Red Jacket,
Moore's Early,
Benwell,
Greenfield,
Red Grape,
Large Red Cherry,
Raby Castle,
Cumberland Red,
Rankin's Red,
Red English,
Fertile D'Angers.

WHITE CURRANTS.

Wentworth Leviathan,
White Cherry,
White Kaiser,
Climax,
Verrier's White,
Large White,
Large White Brandenburg,
White Dutch,
White Grape,
White Pearl,
White Imperial.

BLACK CURRANTS.

Black Grape,
Magnus,
Topsy,
Eagle,
Climax,
Merveille de la Gironde,
Kerry,
Winona,
Saunders,
Beauty,
Ontario,
Black English,
Dominion,
Ogden,
Eclipse,
Bang-Up,
Ethel,
Lee's Prolific,
Stewart,
Success,
Perry,
Clipper,
Star,
Ogden,
Standard,
Perth.

RASPBERRIES.

Marlboro,
Turner,
Dr. Reider,
Sunbeam,
Schaeffer's Colossal,
Columbia,
Herbert.

GOOSEBERRIES.

Troy,	Rideau,
Cluster,	Merton,
Ruth,	Red Jacket.
Governess,	Sylvia,
Smith's Improved,	Ramsay,
Edna,	Vesta,
Mabel,	Richland,
Gibb,	Pale Red,
Saunders,	Downing,
York,	Houghton,
Griffin,	Lady Houghton,
Sussex,	Carman.

STRAWBERRIES.

Senator Dunlap.

ORNAMENTAL AND FOREST TREES.

These, like the fruit trees, commenced to grow very early, and three times were the greater part of the leaves frozen back, it being well on in July before they were in full leaf. All made good progress for the rest of the season. Frost killed the entire crop of maple, elm, and ash seed.

SHRUBS.

Lilacs, hich the year before gave such a profusion of bloom, were last year entirely without flowers. Caragana, Honeysuckle, High Bush Cranberry and all late blossoming varieties, partially escaped injury.

EXCURSIONS TO THE EXPERIMENTAL FARM.

On July 14 a large excursion from Moosejaw Sunday school visited the Farm, between four and five hundred being present.

On July 26, 27 and 28, excursions were run each day by the Department of Agriculture at Regina. The main line of the Canadian Pacific Railway, from the eastern boundary to Mortlatch on the west, brought very large crowds. All the branch lines to the south of the main line contributed largely also. On account of an accident on the Canadian Northern railway, the excursion train from Saskatoon and all points along that line, was cancelled. Numerous speakers were provided, including Dr. Saunders, C.M.G., and the Hon. Mr. Motherwell.

The weather was warm and very favourable for enjoyment in the shade of the trees and avenues on the Farm. The crops were well advanced and looked their best at the time.

Lunch was provided by the lady directors of the Indian Head hospital, and music was furnished by the Indian Head band.

IMPROVEMENTS.

SILO.

During the summer a silo was erected outside the barn, to take the place of the two put up shortly after the Farm started. The silo is 15 feet in diameter inside measure, and 27 feet high, the lower 7 feet being cement, and the upper 20 feet staves held in place by $\frac{3}{4}$-inch iron hoops.

ENGINE HOUSE.

A building 16 x 26 feet was put up to hold the gasoline engine for winter use.

SHEEP HOUSE.

Having purchased some sheep, a house became necessary, and one 20 feet by 40 feet with three divisions, and a loft for hay, was built late in the fall.

FENCING.

Nearly five miles of fencing was erected during the season, four miles of inside cross-fences and one mile on the southern boundary; 1,400 rods of woven wire and 1,470 lbs. of barbed wire was used.

FRUIT CROP.

As already stated, all fruit was destroyed by spring frosts, something that never before happened on the Farm.

The spring opened early in March, and all fruit trees and bushes came in blossom long before they should. Commencing with strawberries, everything was killed in succession, and, excepting two trees of late wild-plums, all blossom was totally destroyed.

CROSS-BRED APPLE TREES.

The following cross-bred apple trees were received from E. D. Smith. Winona, Ont., and used to fill the blanks in the different orchards:—

10 Alberta,	15 Jewel,	10 Prince,
10 Golden,	10 Pioneer,	10 Magnus,
10 Silvia,	10 Tony,	15 Robin.

PREPARING LAND FOR GRAIN CROPS IN SASKATCHEWAN.

During the growing season of 1908 almost the entire western portion of the province suffered from dry weather, and the majority of the new settlers, either from unfamiliarity with the methods of cultivation for the conservation of moisture, or through a desire to bring the greatest possible area under cultivation, naturally suffered a severe disappointment.

In some districts, where in former years moisture had been abundant and proper cultivation had in consequence been neglected in the effort to 'get rich quick,' the partial failure of the crop proved an expensive lesson.

For many years, commencing in 1888, the methods of conserving moisture by 'Breaking and Backsetting' and by 'Summer-fallowing,' now called 'Dry-farming' for a change, have been recommended and universally adopted by the older settlers, but to very many of the new settlers they are unknown. The latter, I trust, may be benefited by the following explanation of the methods which, for a great many years, have proved uniformly successful at the Experimental Farm here, and may with confidence be recommended for every district in the province of Saskatchewan.

BREAKING PRAIRIE SOD.

The success or failure of a new settler often depends on the method employed in the preparation of the land for his first crop, and it is therefore of the utmost importance that the question of 'Breaking' or 'Breaking and Backsetting' be given the consideration it deserves.

For some years past the general practice throughout the country has been to continue breaking three or more inches deep so long as the teams can turn over the sod, then in the fall to disc the top-soil and grow grain in the spring following. From the breaking so done before the end of June, a good crop of wheat, oats or barley is usually obtained, but no amount of cultivation will ensure even a fair crop on this land in the next succeeding year. After the first crop has been cut the soil is usually in a perfectly dry state and remains so, in spite of any known method of cultivation, until the rains come in the spring following. If they are insufficient or late, as is frequently the case, failure of the crop must be the result.

BREAKING AND BACKSETTING.

Breaking and backsetting is the true way of laying the foundation for future success in the greater number of districts throughout the province, and while this method does not permit of as large an acreage being brought under cultivation in the year, it does permit of more thorough work, and ensures better results in the long run. The anxiety of nearly all settlers to sow every acre possible, regardless of how or when the work on the land has been accomplished, may be given as the reason for breaking and discing, to a large extent, superseding the older, better and safer plan.

Breaking and backsetting means the ploughing of the prairie sod as shallow as possible before the June or early July rains are over, and in August or September, when the sod will have become thoroughly rotted by the rains and hot sun, ploughing two or three inches deeper in the same direction and then harrowing to make a fine and firm seedbed. From land prepared in this way two good crops of wheat may be expected. The first crop will be heavy and the stubble, if cut high, at harvest time, will retain sufficient snow to produce the moisture required, even in the driest spring, to germinate the seed for the next crop. The stubble-land can readily be burned on a day in the spring with a warm, steady wind and the seed may be sown with or without further cultivation. In a case where the grass roots have not been entirely killed by the backsetting, a shallow cultivation before seeding will be found advantageous, but as a rule the harrowing of the land with a drag-harrow after seeding will be sufficient.

The principal objection to 'breaking and backsetting' is urged with regard to the backsetting which, no doubt, is heavy work for the teams, but if the discing required to reduce deep-breaking and then the ploughing or other cultivation that must be done in the effort to obtain a second crop, be taken into consideration it must be conceded that in the end 'breaking and backsetting' is the cheaper and better method.

When two crops have been taken from new land it should be summer-fallowed.

SUMMER-FALLOWS AND SUMMER-FALLOWING.

Among the many advantages to the credit of the practice of summer-fallowing may be mentioned:—The conservation of moisture, the eradication of weeds, the preparation of the land for grain-crops at a time when no other work is pressing, the availability of summer-fallowed land for seeding at the earliest possible date in the spring and the minor advantages of having suitable land for the growing of pure seed, potatoes, roots and vegetables at the least cost and with the greatest chance for success, and that of being able to secure two crops of grain with little or no further cultivation.

Summer-fallowing undoubtedly has some disadvantages, but so long as the growing of grain, and more particularly wheat, remains the principal industry of the province, it will be necessary to store up moisture against a possible dry season, to restrain the weeds from over-running the land and on account of the short seasons, to prepare at least a portion of the land to be cropped in the year previous to seeding and a well-made summer-fallow is the best means to this end. Among the disadvantages are:—The liability of the soil to drift, the over-production of straw in a wet season, causing late maturity and consequent danger of damage by frost, and, it is claimed, the partial exhaustion of the soil. The two former may, to a great extent, be overcome by different methods of cultivation, and if the soil can be prevented from drifting, I am satisfied that one of the reasons for the latter contention will disappear.

Various methods are practised in the preparation of fallow, and where the aim has been to take advantage of the June and July rains and to prevent the growth of weeds, success is almost assured. Where the object has been to spend as little time as possible on the work, failure is equally certain.

In my annual report for the year 1889, the following was submitted for the consideration of the settlers. Since then many experiments have been conducted on the Experimental Farm with different systems and again I submit what, on the whole, have been found to be the most successful methods for the cultivation of the soil in Saskatchewan:—

FROM REPORT OF 1889.

'The year just past has been one of extremes. Last winter was one of the mildest on record and March was so very fine that thousands of acres of grain were seeded from the 15th to the 31st, and at no time in the history of the country has the ground been in better condition for the reception of the seed. Immediately after seeding, however, exceptionally high winds set in, followed by extreme drought during the entire growing season. In many places the crops were injured by the winds and finally almost ruined by the succeeding dry weather. In some localities, however, where the farming has been done in accordance with the requirements of the country, the crops did fairly, and considering the excessively dry weather, remarkably well.

'The Experimental Farm suffered in company with every other farm in the country. Perhaps very few suffered as much from winds, but the dry weather, though reducing the yields, did not prove so disastrous as to many others. In this portion of the Territories at least, every settler knows the importance of properly preparing his land. For several years after the country became open for settlement every one imagined that grain would grow, no matter how put in, but now the man is devoid of reason who thinks he is sure of a crop without any exertion on his part. It is true that since 1882 we have had one year in which the land required little or no preparation for the production of an abundant crop but only too many realize the loss in the remaining years from poor cultivation.

'Our seasons point to only one method of cultivation by which we may in all years expect to reap something.

'It is quite within the bounds of possibilities that some other and perhaps more successful method may be found, but at present I submit that 'fallowing' the land is the best preparation to ensure a crop. Fallowing land in this country is not required for the purpose of renovating it, as is the case with worn-out lands in the East; and it is a question as yet unsettled how much or how little the fallows should be worked, but as we have only one wet season during the year, it has been proved beyond doubt that the land must be ploughed the first time before this wet season is over, if we expect to reap a crop in the following year. The wet season comes during June and July, at a time when every farmer has little or nothing else to do, and it

is then that this work should be done. Usually seeding is over by the 1st of May and to secure the best results the land for fallow should be ploughed from 5 to 7 inches deep as soon after this date as possible. Land ploughed after July is of no use whatever unless the rains in August are much in excess of the average. A good harrowing should succeed the ploughing and all weeds or volunteer grain be kept down by successive cultivation. A good deal of uncertainty is felt with regard to a second ploughing, some holding that it is useless; others maintaining that it is an injury; while others again have found it to give from five to ten bushels per acre more than one ploughing. So far the experiments on the Experimental Farm have shown that by far the best returns have been received from two ploughings; and more noticeably was this the case when the first ploughing had been completed in May or June. Without doubt, two ploughings cause a greater growth of straw and consequently in a wet year the grain is several days later in maturing, causing greater danger from frost; but taking the seasons so far passed, 1884 excepted, two ploughings with as much surface cultivation as possible in between, may be safely recommended.

'Above all it is of the greatest importance that the first ploughing be as deep as possible, and that it be done in time to receive the June and July rains.'

After seventeen years' further experience and observation, the following was written on this subject in the Annual Report of the Experimental Farm for 1906.

FROM REPORT OF 1906.

Methods of Preparing Soil for Grain Crops.

METHODS OF PREPARING NEW GROUND.

'In view of the fact that every year brings to the Northwest many new settlers who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this important work may not be amiss.

'In all sections where the sod is thick and tough, breaking and backsetting should be done; while in the districts where bluffs abound and the sod is thin, deep breaking is all that is necessary.

'The former is generally applicable to the southern and western portions, and the latter to the northeastern part of Saskatchewan, where the land is more or less covered with bluffs.

BREAKING AND BACKSETTING.

'The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit backsetting to commence early in August.

'Backsetting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough but three to four inches will give better results.

'After backsetting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.'

DEEP BREAKING.

'Deep breaking, which in some sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and backsetting would give much more satisfactory results, consists in the

turning over the sod as deeply as possible, usually from four to five inches. When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow or disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

'Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come in June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.'

SUMMER-FALLOWS.

'The true worth of properly prepared fallows has been clearly demonstrated in past years in every district of Saskatchewan.

'The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the country, that perhaps a few words on some of the methods employed may be of use to at least some of the new settlers.

'It has been observed in some parts of Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown and in many cases, bearing fully matured seed. It is then ploughed.

'By this method, which, no doubt, saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

'The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and, while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or in fall or spring cultivation.

'As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

'*First Method.*—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

'Result—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

'*Second Method.*—Ploughed shallow (3 inches deep) before the last of June; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

'Result—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

'*Third Method.*—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

'Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

'*Fourth Method.* Ploughed deep (7 to 8 inches) before the last of June; surface cultivated during the growing season.

'Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods

is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

'Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

'In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

'Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.'

During the past two years the term 'dry farming' has been applied to what was formerly known in the west as 'summer-fallowing.'

With the exception of the addition of the use of a soil-packer there is no change in the methods formerly employed, when the spring rains and frequent cultivation were depended upon for the packing of the soil.

Packers are, without doubt, most useful instruments on the farm and where from any cause the soil is loose, they should be used. They are, however, expensive implements and within the means of comparatively few of the new settlers. Fortunately, early ploughing and frequent shallow cultivation may be depended upon to produce almost equally satisfactory results in the majority of cases.

CULTIVATION OF STUBBLE.

When farmers summer-fallow one-third of their cultivated land each year, as they should, one-half of each year's crop will be on stubble. For wheat, the best preparation of this land is to burn the stubble on the first warm, windy day in the spring, and either cultivate shallow before seeding or give one or two strokes of the harrow after seeding, the object being to form a mulch to conserve whatever moisture may be in the soil, until the commencement of the June rains.

The portion intended for oats or barley, should be ploughed four or five inches deep and harrowed immediately; then seeded and harrowed as fine as possible. In case time will not permit of ploughing, good returns may be expected from sowing the seed oats or barley on the burnt ground, and discing it in; then harrowing well.

FALL PLOUGHING.

With regard to fall ploughing it may be said that, as a rule, on account of short seasons and dry soil, very little work can possibly be done in the fall, but if the stubble-land is in a condition to plough and the stubble is not too long, that portion intended for oats and barley may then be ploughed, if time permits.

It is, however, a mistake to turn over soil in a lumpy or dry condition, as nine times out of ten it will remain in the same state until May or June, with insufficient moisture to properly germinate the seed, and the crop will very likely be overtaken by frost.

As to the quantity of seed to sow and the depth of sowing, long experience has shown that the best results are had in Saskatchewan by the sowing of one and a half bushels of wheat per acre or two bushels of barley or oats. Sowing about two inches deep has given the most satisfactory returns, and the seed should be got in as early as is practicable.

CATTLE.

The herd of cattle at present on the Farm consists of thirty-eight pure-bred Shorthorns and twenty grade animals, thirteen of the latter being two and three-year old steers bought for a feeding test.

On November 13 and 14, 1910, the entire herd was tested for tuberculosis and was found to be free from the disease.

FEEDING TEST.

Last fall fourteen steers were obtained in this district for feeding; seven were three years and over, and seven were two years and over. These were divided into two lots and fed the same ration, consisting of one pound of ground linseed meal throughout the test, and six pounds of meal for the first four weeks, increased to eight pounds for the second four weeks, and ten pounds for the third four weeks. In addition, both were fed all the cut oat straw and ensilage that they would eat. The weight of straw consumed by each animal daily was about twenty pounds, and of ensilage twenty-seven pounds. The meal used consisted of oats and barley, equal parts.

On account of not being able to obtain the steers early enough, the test of sixteen weeks could only be started on December 18, after three weeks' preliminary feeding, and cannot be completed until early in April.

For the three months' feeding, the gain was 1,370 pounds. The price paid for the steers was 3¼c. per pound live weight. One steer was ruptured by falling on the cement floor, and had to be withdrawn from the test.

HORSES.

Ten draft horses, with two light animals for driving and scuffling, constitute the working force on the Farm.

SHEEP.

Four pure-bred Shropshire sheep, and twelve grade animals were purchased late in the fall. The former were obtained from John A. Turner, Calgary, and the latter from a farmer in this district.

SWINE.

Two breeds are kept on the Farm, Yorkshire Whites and Berkshires. Following is the number of each at present; one Berkshire sow with litter of ten; three Berkshire sows eight months old; six Yorkshire boars, and six sows. During the year ending March 31, 1911, seventeen pigs were sold to farmers for breeding purposes, of Yorkshires twelve and of Berkshires five.

POULTRY.

Poor success was obtained last year with poultry. At present the breeding pens consist of one Black Minorca cockerel, and twenty pullets, two Barred Plymouth Rock cockerels and thirty-three pullets.

BEES.

I regret to report the loss of the entire colony of bees last spring.

Five hives were put into the cellar in the fall, weak in numbers but with plenty of honey. The spring opened so early that they became restless and were taken out on March 20. Three hives were dead and the others quickly followed with dwindling.

DISTRIBUTION OF SAMPLES.

A distribution of samples of the products of the Farm, was made in the spring to residents of Saskatchewan. The following is a list of the samples sent out:—

Wheat, 3-lb. bags	309
Oats, 3-lb. bags	163
Barley, 3-lb. bags	39
Peas, 4-lb. bags	84
Sundries (Flax, Rye, Rye Grass)	19
Potatoes, 3-lb. bags	440
Total	1,054
Garden peas, 1-lb. bags	125
Garden corn, ½-lb. bags	15

Small seeds, 312 packages containing 4,788 packets of Flower, Garden and Shrub seeds.

Tree Seeds, Maple, 400 packages of 1-lb. each.

Tree Seeds, Ash, 24 packages of 1-lb. each.

Tree Seeds, Shrubs, 60 packages of 1-lb. each.

Tree and Shrub seedlings, 655 packages containing 75 trees each.

Express parcels, trees and shrubs, 35 packages containing 50 trees each.

Crab-apple and plum seedlings, 143 packages containing 12 trees each.

Rhubarb roots, 114 packages containing 6 roots each.

CORRESPONDENCE.

During the twelve months ending March 31, 1911, 10,191 letters were received and 9,974 mailed from this office.

In letters received, reports on samples are not included, and in letters mailed, circulars of instructions sent out with samples are not counted.

METEOROLOGICAL RECORDS.

Month.	Temperature.					Rainfall.		Snowfall.	Sunshine.
	Maximum.		Minimum.		Mean.				
	Date.	°	Date.	°	°	Days.	Inches.	Inches.	Hours.
1910									
April	20	92	22	13	44·3	6	·76	1·75	205·7
May	27	79	2	14	47·66	6	2·92	1·18	251·6
June	20	97	1	27	62·90	6	2·03	5·50	263·2
July	14	94	11	43	66·43	6	·86	....	296·6
August	10	88	31	36	58·7	7	4·03	....	223·2
September	16	82	26	23	50·6	4	·59	....	167·9
October	9	82	28	13	43·46	2	·15	....	173·6
November	6	42	29	13–	16·28	....	....	13·00	46·4
December	21	36	5	24–	6·5	....	....	17·00	69·5
1911									
January	23	23	13	14–	–11·70	....	....	29·75	73·6
February	14	28	4	41–	1·2	....	......	9·50	129·5
March	24	45	4	31–	21·64	....	......	2·75	178·7
						37	11·34	* 80·43	2,079·5

* Reckoning ten inches of snowfall as equivalent to one inch of rainfall, the total precipitation for the year ending March 31, 1910, was 19·383 inches.

I have the honour to be, sir,
Your obedient servant,

ANGUS MACKAY,
Superintendent.

EXPERIMENTAL STATION FOR CENTRAL SASKATCHEWAN

REPORT OF WM. A. MUNRO, B.A., B.S.A., SUPERINTENDENT.

ROSTHERN, March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit herewith the second annual report of the Experimental Station for Central Saskatchewan at Rosthern.

The spring of 1911 opened the earliest of any in the experience of the oldest settler, and seeding began in some instances as early as the last week in March, and became quite general by the middle of April. Severe frosts occurred on May 1, 16 and 21, which cut back the barley to the ground, and did much damage to the peas, oats and wheat. Almost no moisture fell between the melting of the snow in March and June 3, and high winds prevailed almost constantly. Three-quarters of the Farm had been thoroughly summer-fallowed the year previous, and there was plenty of moisture for the germination of grain crops, but the dry dust mulch drifted so much that it was impossible to get small seeds to germinate and grow, and the drifting soil did much damage to the grain. On June 3 moisture appeared in the form of a snow storm which germinated many weeds, and the weeds attained such a vigorous start over the weakened grain that the uniform trial plots of peas, oats and barley were ploughed under and the wheat plots were not what they otherwise might have been.

During August and September, there was an abundance of rainfall which did much to bring on such crops as had made a fair start. The Indian corn, however, was too late in starting and never came to tassel, and was therefore not harvested. The seed of the root crops germinated slowly and unevenly, and the development of the young plants was slow. In August, a second growth started on the carrots, evidently due to the abundance of moisture in the latter part of the season.

SPRING WHEAT.

Sixteen varieties of spring wheat were sown on one-twentieth acre plots.

The plot of Marquis wheat gave a poor stand but better success was obtained with a half-acre plot which yielded at the rate of nearly 28 bushels per acre.

Four plots of Red Fife were sown on successive dates one week apart, and were cut on the same day, no difference appearing in their time of ripening. The difference of yield is no doubt as much influenced by the difference of the effect of the drifting soil as by the difference in the time of seeding. A correct conclusion can only be arrived at in such a case by averaging a number of years of experiments.

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Lbs.	Bush.	Lbs.	Lbs.
1	Stanley	Apr. 1	Aug. 29	150	2,000	33	20	61·0
2	White Fife	" 1	" 22	143	1,920	32	..	60·8
3	Pringle's Champlain	" 4	Sept. 3	152	1,800	30	..	61·7
4	Huron	" 1	" 3	155	1,780	29	40	63·0
5	Red Fife	" 1	Aug. 24	145	1,740	29	..	61·0
6	Riga	" 1	" 24	145	1,660	27	40	61·7
7	Bishop	" 1	" 22	143	1,560	26	..	61·7
8	Preston	" 4	" 22	140	1,520	25	20	63·0
9	Marquis	" 1	" 19	140	1,380	23	..	61·5
10	Chelsea	" 1	" 19	140	1,200	20	..	60·5
11	Preston (Mansel)	" 7	Sept. 3	149	1,660	27	40	61·7
12	Stanley (Mansel)	" 7	Aug. 22	137	2,220	37	..	61·5
13	Red Fife (Geo. L. Smith)	" 4	" 29	147	1,920	32	..	63·0
14	Bobs	" 16	" 24	130	1,380	23	..	60·7
15	Red Fife "Regenerated"	" 16	Sept. 3	140	1,800	30	..	61·0
16	*Kubanka (Durum)	" 16	Sept. 3	140	700	11	40	55·6

* Immature and frozen at time of cutting.

FIELD LOTS OF SPRING WHEAT.

Marquis, Red Fife, Chelsea and Preston were sown in plots larger than the uniform trial plots. The land was all summer-fallow, but varied somewhat in exposure and influence of drifting soil.

FIELD LOTS OF SPRING WHEAT.

Number.	Name of Variety.	Acreage.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
						Bu.	Lbs.	Lbs.
1	Red Fife } Time of Seeding	$\frac{1}{20}$	March 31	Aug. 24	147	34	40	62·5
2	"	$\frac{1}{20}$	April 7	"	140	28	40	61·7
3	"	$\frac{1}{20}$	" 14	"	133	34	39	61·7
4	"	$\frac{1}{20}$	" 21	"	126	32		61·5
5	Red Fife (Field)	·5	" 20	Aug. 22	124	27	12	60
6	" (Rotation)	·8	" 9	" 20	135	26	43	63
7	Chelsea	1·75	" 8	" 19	135	27	33	63
8	Preston	1·4	" 20	" 22	124	25	33	63
9	Marquis	·45	" 23	" 19	124	27	15	65

OATS.

FIELD LOTS OF OATS.

Field plots of Thousand Dollar, Banner and Ligowo Oats were sown with the following results.

The yield of Banner oats was very uneven, due to the effect which the drift of soil had upon it in different parts. Most of the yield came from about two-thirds of the field.

FIELD LOTS OF OATS.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
					Bu.	Lbs.	Lbs.
1	Thousand Dollar	April 20	Aug. 18	120	49	12	37
2	Ligowo	" 21	" 18	119	52	2	36·6
3	Ligowo	" 25	" 30	127	56	..	36·6
4	Banner	" 20	" 31	133	46	..	....

BARLEY.

FIELD LOTS OF BARLEY.

Mensury barley was sown on three field plots with the following results:—

Number.	Name of Variety.	Acreage.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.
						Bu.	Lbs.	Lbs.
1	Mensury (on fallow)	5·1	April 28	Aug. 18	112	38	14	46
2	Mensury (on fallow)	1·8	" 25	" 20	120	38	7	46
3	Mensury (on breaking)	1·5	June 9	Sept. 9	92	48	28	46

BUCKWHEAT.

A plot of buckwheat was sown on breaking on June 9, and grew splendidly and gave promise of a large yield, but was caught with the frost on August 31.

FLAX.

A plot of flax of one-fifteenth of an acre was sown on June 9, and cut on September 24, yielding forty-five pounds. It had been sown at the rate of sixty pounds per acre and yielded at the rate of 18·75 bushels per acre.

Much difficulty is experienced in obtaining clean flax seed. We secured four pounds of good seed and handpicked it, pulled any weeds that appeared in the growing crop and at harvest had forty-five pounds of absolutely pure seed. The same method might be very profitably applied to a sufficient area to produce seed for the next year's field crop.

TURNIPS (SWEDES).

Ten varieties of Swede turnips were grown and their yield computed from the weight of three rows 66 feet long, sown 24 inches apart. The seed was sown on May 16 and the roots were pulled on October 17.

Number.	Variety.	Yield in 1910. Tons.	Lbs.	Number.	Variety.	Yield in 1910. Tons.	Lbs.
1	Hall's Westbury	26	1,790	6	Hartley's Bronze	20	40
2	Bangholm Selected	23	200	7	Magnum Bonum	19	1,160
3	Jumbo	22	400	8	Carter's Elephant	11	1,650
4	Perfection Swede	21	240	9	Halewood's Bronze Top	10	1,010
5	Good Luck	20	1,360	10	Mammoth Clyde	9	700

The average yield of the ten varieties of Swede turnips was 18 tons 1,055 lbs. per acre.

MANGELS.

Eight varieties of mangels were grown and their yield computed from the weight of three rows 66 feet long and two feet apart. The seed was sown on May 11 and the roots were pulled on October 15.

Number.	Variety.	Yield in 1910. Tons.	Lbs.	Number.	Variety.	Yield in 1910. Tons.	Lbs.
1	Half Sugar White	9	260	5	Gate Post	4	1,020
2	Yellow Intermediate	7	1,180	6	Giant Yellow Globe	3	1,150
3	Giant Yellow Intermediate	7	300	7	Prize Mammoth Long Red	3	820
4	Perfection Mammoth Long Red	5	1,330	8	Selected Yellow Globe	3	820

The average yield of the eight varieties of mangels was 5 tons 1,110 lbs. per acre.

CARROTS.

Five varieties of carrots were tested and the yield computed from the weight of three rows 66 feet long and two feet apart. The seed was sown on May 20 and the roots were pulled on October 14.

Number.	Variety.	Yield in 1910. Tons.	Lbs.	Number.	Variety.	Yield in 1910. Tons.	Lbs.
1	Improved Short White	3	1480	4	Half Long Chantenay	3	50
2	White Belgian	3	1480	5	Mammoth White Intermediate	2	1170
3	Ontario Champion	3	380				

The average yield of the five varieties of carrots was 3 tons 512 lbs. per acre.

SUGAR BEETS.

Three varieties of sugar beets were tested and their yield computed from the weight of three rows 66 feet long and two feet apart. The seed was sown on May 10 and the roots were pulled on October 15.

Number.	Variety.	Yield in 1910. Tons.	Yield in 1910. Lbs.	Number.	Variety.	Yield in 1910. Tons.	Yield in 1910. Lbs.
1	Vilmorin's Improved............	5	1,770	3	French Very Rich..............	2	1,390
2	Klein Wanzleben................	5	890				

The average yield of the three varieties of sugar beets was 4 tons 1,350 lbs. per acre.

POTATOES.

Five plots of standard varieties of potatoes were grown. They were planted in rows thirty inches apart and eight inches apart in the row, and were covered with the plough to a depth of about four inches. The seed was cut to two eyes each. The rows were cultivated as often as weeds made an appearance and were hilled in June.

The planting was done on May 13, and the digging on October 8.

Number.	Variety.	Yield in 1910. Bush.	Yield in 1910. Lbs.
1	Everett..................	363	3
2	Irish Cobbler..................	357	45
3	Gold Coin..................	344	30
4	Dreer's Standard..................	297	41
5	Ashleaf Kidney..................	296	13

The average yield of the five varieties of potatoes was 19,910 lbs. (331 bushels 50 lbs.) per acre.

Besides the standard varieties, a sample was obtained from a farmer of the neighbourhood and from it six distinct varieties were tested under conditions identical with those of the five standard varieties with the following results.

Number.	Variety.	Yield in 1910. Bush.	Yield in 1910. Lbs.
1	R. E. F. No. 6..................	348	8
2	R. E. F. No. 3..................	297	44
3	R. E. F. No. 5..................	284	22
4	R. E. F. No. 4..................	287	40
5	R. E. F. No. 1..................	268	24
6	R. E. F. No. 2..................	247	20

The average yield of these six unnamed varieties is 287 bushels, 26 pounds.

From a comparison of the two tables it will be seen that only two of the unnamed varieties yielded as high as the lowest standard variety. Then it will be noticed that if this farmer had taken the pains to first learn the comparative values of his own varieties and then had selected that variety which yielded the best, he would have had an average yield of 348 bushels instead of an average of 287 bushels, thus giving to him a distinct gain of at least 61 bushels per acre.

Opinion is divided as to whether potatoes should be hilled or left unhilled in this part of the country. To gain experience in this, a large plot of potatoes was divided into two parts, which were treated exactly alike except that one part was hilled in June and the other was left level. At digging time, two typical rows were selected from each part and a calculation was made therefrom with the following results:—

Unhilled—279 bushels per acre.

Hilled—225 bushels per acre.

TREES AND SHRUBS.

Upwards of five hundred apple trees were received in the spring of 1909, and heeled in in nursery rows. These came through the winter in good condition. They were planted in rows fifteen feet apart both ways in the spring of 1910, and withstood the dry summer well. So also did the plums. The bush fruits including raspberry, gooseberry and currant, suffered much from the late spring frosts and the drying winds.

THE GARDEN.

An attempt was made to grow annual flowers and vegetables from seed, but there being as yet no protective windbreaks on the Farm, the young plants were cut off and killed by the blowing sand.

HOUSE PLANTS.

We have had the windows of the Superintendent's house full of plants and flowers all winter, such plants as begonias, geraniums and coleus coming through without injury from cold.

What was most pleasing of all was a collection of bulbs of narcissi, hyacinths and tulips forwarded from the Central Farm. These were potted in October in about equal parts of sand and black prairie mould, watered thoroughly and placed in a cool, dark, dry cellar. In about three weeks, they were found to be very dry and were thoroughly soaked again and this was repeated at intervals of from two to four weeks. We began taking them from the cellar about Christmas time and did not take the last up till the first week in March and had a continuous bloom from the Christmas holidays till nearly Easter. Only one variety of tulip was tried in the house, the Duchesse de Parma, and it was particularly beautiful. It is intended to try a number of varieties of tulips another year.

Thirteen hundred tulips of several varieties were planted in a bed in October, the results of which will appear in next year's report.

BUILDINGS.

The Superintendent's house, which was begun in August, 1909, was completed in May, 1910, except the painting, which was deferred, on account of the dust storms, till July.

I should like to draw attention to one feature of the construction of the house which means more for its warmth than perhaps anything else. I refer to the back plastering of all the outside walls. The house is a frame structure and all studding on outside walls have strips nailed to them reaching half the width of the stud. To these strips lath are nailed and the lath covered with plaster. When the inside of the walls is lathed and plastered after this method there are then two dead-air spaces.

An addition was made to the implement building. The former building was 60 feet by 20 feet and was found to be inadequate. An additional twenty feet gives us ample room for the present.

WATER SUPPLY AND SEWAGE DISPOSAL.

The water supply comes from two sources, namely: Soft water from two forty barrel storage tanks in the basement and hard water from a well sixteen feet distant from the house. In the attic are two tanks, each 3 feet by 5 feet by 2½ feet, into one of which is pumped soft water from the basement and into the other, hard water from the well. From the soft water tank, water is piped to the bath tub and wash basin in the bath room, to the sink and heater in the kitchen and from the hard water tank water is piped to the commode and bath tub in the bath room and to the sink in the kitchen. The pumping of the water from the basement is not a difficult task, a man being able to fill the tank in ten minutes, but the pumping of the water from the well requires a man working for thirty minutes. We have recently tried a 1½ h.p. gasoline engine for this and find it works very satisfactorily.

The well is twenty-three feet deep, is 4½ feet across, and is lined from the bottom to six inches above the level of the ground with a six-inch solid concrete wall. This prevents the possibility of any water entering the well except through the bottom.

We believe that the well would be much more satisfactory if it were five feet in diameter inside the curb instead of three, because the water enters too slowly, coming as it must only from the bottom. The water is conducted from the well to the house through a 2-inch pipe seven feet below the surface of the ground.

For sewage disposal, there is a septic tank immediately outside the wall of the outer kitchen with its top level with the top of the ground. The tank is three feet deep, three feet wide and ten feet long, is made of concrete six inches thick, and has three compartments. The wall between the first and second compartments is 33 inches high, the second wall 32 inches and the overflow from the third compartment 31 inches above the bottom of the tank. The tank is covered with lumber and about two inches of earth and about two feet above this a roof. For winter, the intervening space between the cover and the roof is filled with chaff and the whole thing covered to a depth of about three feet with straw. The tank has been in use for more than a year and has given no trouble from disagreeable odours nor from frost in winter. The outlet from the septic tank connects with the drain from the cellar seven feet below the surface and leads to a cesspool four hundred feet distant.

In the autumn, the tank was opened to be cleaned of any solid matter that might have accumulated, but none was found.

A float with a light wood indicator in the third compartment registers the depth and when this compartment is full, a rod connected with a plug in the outlet at the bottom is pulled and the compartment emptied with a rush which prevents any possibility of the sewer pipe clogging.

There are automatic valves for this purpose on the market, but we find the simple cedar plug inexpensive and absolutely proof against disarrangement. As we have occasion to pass the tank several times daily, it is no inconvenience to pull the plug, when the indicator shows the tank to be full.

LIVE STOCK.

There are six horses on the Farm, four heavy draft, one general purpose, and one driver, all sound and in good condition. The heavy draft horses are especially fine animals. This number was found to be insufficient to do the work of the Farm, and on several occasions an extra horse was hired.

There are two pure-bred Ayrshire cows, one nine years old and one three.

CORRESPONDENCE.

During the year there were 396 letters received and 342 sent out, irrespective of circulars.

MEETINGS ATTENDED.

It was my good fortune to attend a series of eight Institute meetings in June in company with Prof. Bracken of the University of Saskatchewan. We started out with a team at Prince Albert on June 13, and followed a westerly and southwesterly course on the west side of the North Saskatchewan River, taking the train again at Borden on June 22, the distance covered being upwards of one hundred and twenty-five miles. The country passed through was exceedingly beautiful, being rolling and somewhat broken with woods and lakes. It was rather sparsely settled, but was filling up very rapidly. The crops were doing splendidly, not apparently affected by the drought which was so severely felt in the open plains in certain other parts of the province.

I acted as judge at two exhibitions and attended the meetings of Farmers' Institute workers and the Saskatchewan Poultry and Pet Stock Show in Saskatoon and the Agricultural Societies' Convention and Winter Fair in Regina.

METEOROLOGICAL RECORDS.

A set of meteorological instruments consisting of maximum and minimum thermometers, rain guage and sunshine recorder were received in November and records kept from December 1.

Month.	Temperatures.			Date.	Mean.	Snowfall.	Hours of Sunshine.
	Max.	Date.	Min.				
	°		°		°	Inches.	
December..........	34·5	17	−28	31	5·8	17	92·1
January.................	22·9	4	−43·2	2	−17·2	22	99·5
February.........	35·5	25	−31	5	−3·6	8	169·2

I have the honour to be, sir,

Your obedient servant,

WM. A. MUNRO,

Superintendent.

EXPERIMENTAL STATION FOR SOUTHERN ALBERTA.

REPORT OF W. H. FAIRFIELD, M.S., SUPERINTENDENT.

LETHBRIDGE, ALTA., March 31, 1911.

Dr. WILLIAM SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit the fourth annual report of the operations on the Experimental Station for Southern Alberta, at Lethbridge, for the year ending March 31, 1911. Three seasons' crops have been grown, the first spring and summer after the Station was established being devoted to the breaking and preparation of the sod.

The results obtained during the season of 1910 on the Farm here are of more than usual interest, due to the fact of the season being so extremely dry. The necessity of a farmer summer-fallowing at least a portion of his land every year, to insure against a dry season, is clearly emphasized, for in reality the so-called 'new science of dry farming' is merely intelligent summer-fallowing either once in two or once in three years. By ploughing the land in the spring and not allowing any vegetation whatsoever to grow all summer, the larger part of the moisture that falls at this time is carried over in the soil for the use of the crop the next year. The past season has the undesirable distinction of being the driest in southern Alberta since reliable meteorological observations have been made, and, according to the statements of the older residents, there has been no summer so dry since 1886. During the autumn of 1909 there were no rains worth mentioning. The autumn was followed by a winter of practically no snow. The amount of the total precipitation during the following months in 1910 speaks for itself, and no further explanation of the light yields is required:—

	Inches
March	0·17
April	0·28
May	0·79
June	0·53
July	0·09
Total	1·86

Although it may scarcely be necessary to offer any further suggestions as to the reason for the small yields reported in the following pages, still the fact that we obtained the crops that we did is certainly extraordinary, considering the fact that less than one and two-thirds inches of moisture fell on the grain from the time it was sown in April till it was harvested in July. Not once during this whole four months did we get a good rain; what little moisture there was came in small showers that did not wet the surface of the soil deeper than two inches at any time. Crops sown on land that had not been summer-fallowed in 1909 failed to produce a yield of any kind.

The winter of 1909-10, on the whole, was not particularly severe. The coldest weather occurred in December, and again in February. The lowest temperature recorded was —35·5° on February 22. The most noteworthy point about the winter was the practical absence of snow, combined with the fact that during the periods when the temperature was relatively high, more than the usual amount of windy weather prevailed. This dried out still more the fields that were already drier than they should be.

The season opened up very early. The first work done on the land in the spring of 1910 was discing in the afternoon of March 4. For a few days it was possible to work only in the afternoons, as there was too much frost in the forenoons, but by the 11th, the land had softened sufficiently to make it possible to plough. The last frost in the spring was on June 4, when 31·0° was recorded. The first frost in the autumn was on August 23 when 31·5° was recorded, and on the following night the thermometer dropped to 30·0°. On account of the drought, the grain ripened very early. The first winter wheat was cut on July 14 and the first spring wheat was ripe July 23. Red Fife was ripe August 1.

Winter wheat on the Farm came out in the spring very well, much better than after the previous winter. On account of the very dry autumn of 1909, the winter wheat throughout a large portion of the southern part of the province did not come up well, and the major portion of the land so planted had to be resown with spring wheat. At the present time, more winter wheat is sown on breaking than on summer-fallow, and this is the principal reason why it is so difficult to get the grain up in a dry autumn. Although there may be moisture in the subsoil, the sods themselves have dried out and it is impossible to drill through to the moisture below, which is not the case with summer-fallowed land.

TWO FARMS.

Of the 400 acres on the Farm, one-fourth can be irrigated; the balance is devoted to 'dry' or non-irrigated farming. Two experimental farms are really being operated at Lethbridge. Their object is, not to compare the relative merits of the two systems, but to study their individual problems. To aid in doing this and to prevent confusion, the report is divided into two parts. Part I deals with the results from the non-irrigated or 'dry' farm, and Part II with the results from the irrigated farm. In this connection, it might be well to point out that the yields of even the same variety of crop grown on the two farms in any one season are not necessarily comparable, and that an increased yield on the irrigated portion may not be entirely due to irrigation, owing to the fact that the preparation of the land in the two fields may not have been identical.

Although many of the tests carried out are the same on both the dry and the irrigated farms, still it would be well for the reader, if he wishes to get a comprehensive grasp of the work, to read both parts. For example, any suggestions offered regarding the preparation of the land, particularly the raw prairie, in Part I, is equally applicable to the preparation of the land that is intended to be irrigated.

PART I.—THE NON-IRRIGATED OR 'DRY' FARM.

EXPERIMENTS WITH WINTER WHEAT.

As stated above, there was very little winter-killing in any of the plots or fields of winter wheat on the farm, with one notable exception of those plots sown early, *i.e.*, in July and the first part of August. The land on which all the winter wheat was sown was summer-fallowed in 1909. None was sown on breaking. It was ploughed once and during the summer given enough surface cultivation to kill the weeds and volunteer grain.

WINTER WHEAT—TEST OF VARIETIES.

Ten varieties of winter wheat were sown August 25 at the rate of about one bushel per acre, on plots of one-sixtieth of an acre each.

WINTER WHEAT (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of grain per acre.		Weight per measured bushel after cleaning
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Kharkov........	Sept. 10	July 14	24	9	3	1,200	20		62·8
2	Ghirka.........	" 10	" 16	22	9	3	990	16	30	58·9
3	Turkey Red (No. 380).........	Aug. 25	" 14	22	9	2½	840	14	..	62·8
4	Reliable	" 25	" 20	26	10	4	840	14	..	59·8
5	Prosperity......	" 25	" 16	24	9	3½	660	11	..	59·5
6	Dawson's Golden Chaff.........	" 25	" 19	25	10	3	600	10	..	59·9
7	Red Velvet Chaff	" 25	" 16	23	9	3½	540	9	..	60·1
8	Abundance	" 25	" 20	22	10	3½	480	8	..	59·5
9	Early Windsor...	" 25	" 20	25	10	3½	480	8	..	59·1
10	Red Chief	" 25	" 19	23	9	3½	330	5	30	57·1

An interesting variety in the above list is the Ghirka, which is a beardless variety of the Turkey Red type. It was obtained from the Kansas Agricultural College and they state that it will yield nearly as well as the Kharkov, under their conditions. We have only tested it one season, but it will be a welcome addition to our list of winter wheats if it shows itself to be as good in yield and quality as the bearded varieties.

HARROWING WINTER WHEAT IN SPRING.

A field of 5·8 acres of Kharkov was sown on summer-fallow on August 24. On April 9, 1910, one end of this field was harrowed. Both pieces were ripe and cut July 16; the yields obtained were:

	Area.	Yield per Acre.	
		Bush.	Lbs.
Part harrowed April 9..	0·9	18	48
Part not harrowed..	4·9	16	15

In connection with this experiment, it should be explained that the part harrowed was at one end of the field on somewhat lower ground and the increased yield may not be altogether due to the harrowing. As the advisability of this treatment for winter grain seems to be somewhat in doubt it will be of interest to learn the results of a similar experiment to be carried on in 1911.

FIELD LOTS OF WINTER WHEAT.

Sown on summer-fallow the latter part of August and all ripe July 15.

Variety.	Area.	Yield per acre.	
	Acres.	Bush.	Lbs.
Turkey Red, No. 380	4·22	16	55
Turkey Red, from commercial sample	0·81	12	21
Kharkov	20·10	13	54

TIME TO SOW WINTER WHEAT.

In studying the conditions that might influence winter-killing, the experiment in which the winter wheat is sown at different dates is interesting. Average results are given for three years, except where indicated by footnote.

The land is all prepared in exactly the same manner and the only difference in treatment is that the seed is sown at different times. It was all sown with the same drill and at the same rate per acre. In 1908 and 1909 it was grown on breaking, in 1910 on summer-fallow. The area of each plot in 1910 was one-tenth of an acre and the seed was sown at the rate of one bushel per acre.

WINTER WHEAT (non-irrigated)—Dates of Sowing.

Date of Sowing.	Date Ripe in 1910.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
July 15	winter-killed			1	30*
August 1	July 14	0	30	12	10*
" 15	" 14	8	20	27	41
September 1	" 14	15	20	31	53
" 15	" 14	15	10	23	29
October 1	" 20	13	10	20	11
" 15	" 26	9	10	16	21
November 1	August 1	9	..	10	49
" 15	Not sown				
December 1	August 8	6	40	..	..

* Average for two years only.

In studying the yields given in the tables for 1910, it will be noted that the wheat sown on July 15, winter-killed entirely and that sown on August 1, for all practical purposes, did the same. It should be mentioned that these plots came up well and made a vigorous growth, forming a good mat on the ground before the winter set in. That sown August 15 made more growth than the seeding made September 1.

After watching these tests for the past three seasons, the writer has been led to believe that it is not wise to sow winter wheat early enough in the season to allow much growth to take place in the fall. It would seem that if the grain comes up well and from three to five blades are developed on each plant, the crop has a better chance of going through the winter without injury than if more growth takes place in the fall. I believe one would be safe in making the statement that, under our conditions, in average years, the best time to sow winter wheat on well-prepared land is between August 20 and September 1.

AMOUNT OF WINTER WHEAT TO SOW PER ACRE.

The proper amount of winter wheat to sow per acre is a question that has been the cause of a great deal of discussion among the farmers of southern Alberta for the past few years. Quite a general practice has been to seed lightly, that is, from two to three pecks per acre, but some of the most successful growers are beginning to sow larger amounts of seed. In the following table it will be noted that the average results, for the three years that the test has been carried on, would indicate that heavier seedings pay. Even in the extraordinarily dry season of 1910, the very light seedings did not give as much increase in yield over the heavier ones as one would be inclined to expect. Judging from the average results given in the table, it certainly appears that it would pay to sow at least one bushel of winter wheat seed per acre.

The size of the plots used in this test in 1910 was one-tenth of an acre. They were all sown with Kharkov on August 23, on summer-fallowed land.

WINTER WHEAT—Rates of Seed per Acre (non-irrigated).

Rate of seed per acre.	Date Ripe in 1910.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs.	July 16	16	40	27	47
30 "	" 16	15		33	20
45 "	" 16	15	30	35	36
60 "	" 16	13		41	17
75 "	" 16	13	30	43	1
90 "	" 14	14		42	19
105 "	" 14	11	20	38	3
120 "	" 14	12	20	38	47

EXPERIMENTS WITH SPRING WHEAT.

Although winter wheat yields more, under normal conditions, than does spring wheat, still, owing to a certain element of uncertainty that will always be connected with the wintering of wheat sown in the fall, together with the fact that it is possible to obtain a crop of spring grain the same season that it is sown, it is probable that the importance of spring wheat will never be second to winter wheat in southern Alberta.

SPRING WHEAT—TEST OF VARIETIES.

Twelve varieties of spring wheat were grown on summer-fallowed land in 1910 in plots of one-sixtieth of an acre each. The varieties were all sown on March 30, except Red Fife, which was sown on April 1. The seed was sown at the rate of about one bushel and one peck per acre.

SPRING WHEAT (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre	Yield of Grain per Acre		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bus.	Lbs.	Lbs.		
1	Red Fife..	Aug. 1..	125	25	10	3	900	15	..	58	25	56
2	Preston. ..	July 27..	119	23	8	3	660	11	..	59	24	46
3	White Fife	" 27..	120	25	9	3	780	13	..	57·2	23	56
4	Marquis...	" 26..	119	22	9	3	660	11	..	60·2	23	43
5	Chelsea....	" 26..	119	20	8	3	480	8	..	60·1	23	7
6	Pringle's Champlain	" 25..	118	22	9	3½	600	10	..	59·3	22	46
7	Kubanka (Durum).	Aug. 1..	125	26	8	3	1020	17	..	61·1	22	46
8	Stanley....	July 26..	120	24	9	3½	630	10	30	56·5	22	43
9	Huron.....	" 26..	120	24	9	3½	720	12	..	57·9	22	43
10	Bishop	" 26..	117	21	9	3	570	9	30	58·2	21	36
11	Gatineau...	Aug. 1..	124	24	8	3½	600	10	..	58	18	26
12	Riga	July 23..	114	24	9	2¾	300	5	..	60	15	30

FIELD LOTS OF SPRING WHEAT.

Wheat sown on stubble land, although it came up, did not grow more than ten inches or a foot high, and failed to produce any crop at all. There was apparently no difference in the amount of growth on the stubble land where spring ploughed and on that double-disced in the spring and not ploughed. The crop also failed on a three-acre field of June breaking. The straw was somewhat higher and heavier on this than on the stubble land, but there was not enough grain produced to pay for cutting.

The following fields were sown on summer-fallowing at the rate of about one bushel and one peck per acre.

FIELD LOTS OF SPRING WHEAT.

Variety.	Area.	Date Sown.	Date Ripe.	Yield per acre.	
	Acres.			Bush.	Lbs.
Red Fife..	4·82	Mar. 24 ...	Aug. 3	11	6
Red Fife II	0·12	Apr. 1....	" 3.....	10	33
Marquis....	1·60	" 1 ...	July 27.....	9	47

SPRING WHEAT—RATES OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre. They were all sown April 4. The preparation of the land for 1910 was summer-fallow, for the two previous seasons, June breaking. The variety used for the three seasons was Red Fife.

SPRING WHEAT—Rates of Seed per Acre (non-irrigated).

Rate of Seed per Acre.	Date Ripe 1910.	Yield in 1910.		Average yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs.	Aug. 8	8	..	10	20
30 "	" 8	8	40	15	7
45 "	" 3	11	..	20	..
60 "	" 1	10	40	20	53
75 "	" 1	9	40	21	7
90 "	" [illegible]	9	20	21	20
105 "	" 1	10	40	23	20
120 "	July 28	10	20	22	47

The most interesting point shown by the table is the fact that, notwithstanding the very dry season, the light seedings did not yield better than the heavier ones, indicating that the results expressed in the average yield for the three years are probably reliable.

SOWING WINTER WHEAT IN THE SPRING.

A great many letters are received asking what the result would be if winter wheat were sown in the spring. Some farmers even maintain that it is safe to reseed winter wheat fields that have been killed out more or less during the winter, with winter wheat in the spring.

When winter wheat is sown in the spring, its inclination is to stool out very freely and to be slow about shooting for head, so that, even when a good crop is produced, it is much later than spring wheat and is almost certain to be frosted. However, on account of the idea that appears to be more or less prevalent among certain farmers that such a practice is feasible, the following experiment was carried out. On March 24, two plots of one-sixtieth acre each were sown on summer-fallowed land, with the following results:—

WINTER WHEAT—Sown in Spring.

Variety.	Date Ripe.	Yield per Acre.	
		Bush.	Lbs.
Kharkov (winter wheat)	Aug. 18	15	..
Red Fife (spring wheat)	" 2	17	..
Difference in time of maturing		16 days.	

In a normal year, when the maturing of the grain is not hastened by drought, it can readily be seen that the great difference in the time it takes the winter wheat, as compared to a spring variety, to ripen would make it very unsafe to sow the former as spring wheat.

CULTURE OF WINTER AND OF SPRING WHEAT.

So many letters of inquiry concerning the growing of winter wheat and also of spring wheat are received at the Station, that it may be excusable to repeat what was said in last year's report and give a very brief outline of the general practice followed in the growing of these crops in southern Alberta. Anything in the way of preparation of the soil that will apply to spring wheat is of course applicable in general to oats or to barley.

PREPARATION OF SOD LAND.

The sod should be broken in May or June, while the soil is moist and before the rainy season is over. May breaking usually gives better results than June breaking, the reason for this being that less of the rains is used up by the growing grass and, consequently, more is stored in the subsoil; also, the moist weather of June is conducive to the rotting of the grass roots. The sods should be rolled or flattened down in some manner as fast as broken. This connects the furrow slice with the subsoil and facilitates the rotting process. The rolling should be done at noon and at night before the teams leave the field. If a tractor is used, a weighted roller should be attached behind the ploughs. The common practice is to break 3½ to 4½ or even 5 inches deep; after this, the surface cultivation should be shallow. No attempt should be made to cut through the sods with the discs, but merely to go deep enough to form a mulch on the top to prevent rapid evaporation. If one is prepared to do this surface cultivation after rain, while the sods are moist, it will be found that the land is worked more economically and to much better advantage. Enough work should be done to get sufficient loose material to fill in the cracks between the sods which will then rot sufficiently during the summer to be loose and in good condition for growing a crop the following spring. It is generally found necessary, if a thorough job is desired, to double-disc the land twice, using a drag harrow and possibly a float after each double-discing. The latter is a contrivance made of four or five two-inch planks a foot wide, twelve to sixteen feet long, laid flatways and lapped so as to resemble somewhat a washboard. This implement, when weighted with stone or sod added to the weight of the driver, crushes quite effectively small pieces of sod which, when dry, could not be broken up well with a drag harrow. *The float should be followed immediately with a harrow,* for evaporation takes place very rapidly from the land when the surface is left too smooth. If the floating is done just before seeding, the seed drill will, of course, roughen the surface. A light harrowing immediately after seeding is advisable.

For the best results with spring grain, this work should be done on the sod during the previous summer (say before the rush of harvest). In this way, all the land requires in the early spring of the next year is a harrowing just as the frost draws out, to prepare it for the seed drill.

SOWING ON FRESH BREAKING.

Considerable land during the past few years has been broken in April and immediately sown to grain. Although fair results are often obtained in this way, it is not a practice that can be recommended, for, if the season is dry, the resulting crop may be disappointing, and, on account of the sods not having had a chance to rot properly, the second crop is not nearly as good as the second crop after breaking the land in May or June and allowing it to lie fallow that summer as described above.

BACKSETTING.

Although it is not customary to backset in this district, it is a practice that cannot be too highly recommended. When backsetting is to be done, the sod should be broken as shallow as practicable and immediately rolled, or, if a roller is not available,

it may be flattened down by a weighted float. The earlier the breaking after the grass has started growth, the better will be the results. In the latter part of July or early in August, if winter wheat is to be sown, the land is again ploughed (with stubble bottom ploughs) about two or three inches deeper than it was broken. The depth of this second ploughing should be governed by the depth of rotting that has taken place in the subsoil. In ordinary years, where the land has been broken in May or early in June, the grass roots for about two inches down in the subsoil have become rotted. If spring grain is to be sown, this second ploughing or 'backsetting' may be done any time in August or, if desired, in September when the sods and grass roots are better rotted, but, on the other hand, the land is apt to be a little drier at that time and consequently the soil is inclined to be too loose, which tends to make it dry out. This condition can be largely overcome by the use of a subsurface packer used at noon and at night before leaving the field. The packer should be immediately followed by a harrow. After backsetting, a seed bed can often be prepared by the use of a harrow only, but a disc should be used if the conditions of the ground require it. Special attention should be called to the importance of harrowing each day's ploughing at night before leaving the field. If an engine is used, the harrow should be attached to the plough, or, if horses are used on a sulky or a gang plough, one section of a harrow should be attached so that the land is harrowed as fast as it is turned. This practice of harrowing land immediately after it is ploughed should always be followed; too much stress cannot be laid on this point.

It might be well to state here that backsetting is the only feasible way of preparing land that is to be used for a garden or for trees and shrubs the second season after a settler goes on raw land.

SUMMER-FALLOWING.

In speaking of this subject, Mr. Angus Mackay, Superintendent, Experimental Farm, Indian Head, puts in a concise way some of the advantages of summer-fallow, with special reference to its application to conditions in southern Saskatchewan, which are in so many ways similar to those found in southern Alberta, the one notable exception being that, so far, winter wheat has not been very successful there. He says:—

> 'Among the many advantages to the credit of the practice of summer-fallowing may be mentioned: The conservation of moisture, the eradication of weeds, the preparation of the land for grain crops at a time when no other work is pressing, the availability of summer-fallowed land for seeding at the earliest possible date in the spring and the minor advantages of having suitable land for the growing of pure seed, potatoes, roots and vegetables at the least cost and with the greatest chance for success, and that of being able to secure two good crops of grain with little or no further cultivation.

Mr. Mackay adds, however:—

> 'Summer-fallowing undoubtedly has some disadvantages, but, so long as the growing of grain, and more particularly wheat, remains the principal industry of the province, it will be necessary to store up moisture against a possible dry season, to restrain the weeds from over-running the land and, on account of the short season, to prepare at least a portion of the land to be cropped in the year previous to seeding and a well-made summer-fallow is the best means to this end. Among the disadvantages are: The liability of the soil to drift, the over-production of straw in a wet season, causing late maturity and consequent danger of damage by frost, and it is claimed, the partial exhaustion of the soil. The two former may, to a great extent, be overcome by different methods of cultivation, and if the soil can be prevented from drifting, I am satisfied that one of the reasons for the latter contention will disappear.'

The growing of winter wheat in southern Alberta gives an added reason why, in this province, farmers should give summer-fallowing even more careful consideration, if possible, than where spring wheat alone is raised. In this connection, summer-fallowing certainly has a distinct advantage that is not mentioned in the quotation above, for it must be admitted that there is a somewhat greater risk in getting a stand of winter wheat on sod than on well-prepared summer fallow. In seasons like that of 1909, in which there was little or no precipitation during the months of August, September and October, it is very difficult to get the grain sown on fresh breaking to come up. Although there is ample moisture in the subsoil, the sods themselves have become very dry and have not rotted sufficiently by August to allow the discs or shoes of the seed drill to cut through them so that the seed may be deposited on the moist subsoil. Under these conditions, opportune rains must be depended upon to bring the seed up. On well prepared summer-fallow, conditions are quite different, for if the land is ploughed in May or June, while it is moist, before the rainy season is over and while the weeds are not more than a few inches high, little trouble is experienced in getting the lower part of the furrow slice firm and and keeping it moist. The depth of the ploughing should not be less than five or six inches and eight is recommended. The harrow should immediately follow. Too much stress cannot be laid on the importance of doing this ploughing early, *i.e.,* before the weeds have had a chance to grow large enough to pump out the moisture that should be stored in the subsoil for the crop that is to follow. If, for example, the weeds and volunteer grain are allowed to grow a foot or more high and it is necessary to use a chain on the plough to get them turned under, the work on the summer-fallow is practically thrown away, for the land is certain to turn up lumpy and loose and the supply of moisture that should be in the subsoil has already been heavily drawn upon.

If, after the land is ploughed, hard rains form a crust, it should be broken up with a drag harrow before the land had a chanceto dry out to any extent. Sufficient surface cultivation should be given during the summer to prevent all weeds from growing, *i.e.,* the land should be kept perfectly bare. Two of the best tools to do this with are an ordinary harrow and a duck-foot cultivator. The latter implement is too rarely seen on the grain farms of southern Alberta. A serious mistake is made when a disc is substituted, for the reason that it cuts down too much and so forms too deep a mulch. It also pulverizes the land excessively, causing it to drift too readily with the wind. The duck-foot cultivator can be set very shallow, just deep enough to cut off the small weeds and it merely loosens the surface without making it fine, leaving it in a granular rather than in a powdery condition. Another great advantage of the cultivator over the disc, that will appeal strongly to farmers, is that a summer-fallow may be cleaned much more economically with it. Whereas it is necessary to double-disc a piece of ground if a satisfactory job is to be accomplished, with this cultivator the same four horses will cover at least twice as much ground in a day and do the work better.

TIME TO SOW.

Winter Wheat.—Our results for the past three seasons certainly indicate that from the middle of August to the first of September is the best time to sow. On well prepared, summer-fallowed land, where it is possible to maintain the moisture zone relatively near the surface, we have reason to believe that the August or early September sowing will give more satisfactory results as a rule than will July sowing.

Spring Wheat.—Early sowing is of prime importance. Every effort should be made to conclude the seeding of this grain by May 1.

QUANTITY OF SEED TO SOW.

This, as well as the proper time to sow, is a point about which we have not yet sufficient data at hand to draw very satisfactory conclusions, consequently, any state-

ments that are made in this connection must be considered as tentative. Sixty pounds of winter wheat and seventy to seventy-five pounds of spring wheat is probably a safe quantity to sow per acre.

SMUT.

Both winter and spring wheat seed should always be treated for bunt or stinking smut. Either the formalin or the bluestone method is satisfactory providing the work is done carefully. Very smutty grain should never be used for seed, for, even when treated thoroughly, some smut is apt to appear in the resulting crop. If seed wheat is treated every year whether any smut can be found in it or not the trouble will be kept in subjection. With either method, it is important that each kernel be thoroughly wet. As to the strength of the solution, it should be strong enough to kill smut spores, but not so strong as to injure the vitality of the grain. The strength of solution most often recommended is one pound of formalin to thirty-two gallons of water, and in the case of bluestone, one pound dissolved in six gallons of soft water. The sacks into which the grain is to be put after it is treated should have been dipped in the solution also. In the case of formalin, it is the fumes that kill the spores, so, after the grain has been treated, it is a good plan to throw it into a heap and cover it with a canvas or with empty sacks, but see that the covering used is free from smut spores.

EXPERIMENTS WITH OATS.

OATS—TEST OF VARIETIES.

Twenty-one varieties were sown on April 14, at the rate of about two bushels and one peck per acre on summer-fallow. The area of each plot was one-sixtieth acre.

OATS (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.	Average Yield for three years.	
					Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
1	Improved American ...	Aug.	1	108	23	9	5	750	22	2	37	63	16
2	Lincoln..............	"	1	109	20	9	5	600	17	22	36·3	58	18
3	Abundance...........	July	25	102	25	9	5½	840	24	24	35	53	8
4	Banner..	"	27	104	22	9	5½	720	21	6	35·8	52	22
5	Irish Victor..........	"	27	104	24	9	4½	780	22	32	33	51	26
6	Danish Island.	"	26	103	23	9	5	840	24	24	34·5	51	23
7	Golden Beauty.........	"	26	103	26	9	5	720	21	6	35·5	51	24
8	Improved Ligowo	Aug.	1	109	24	9	5	660	19	14	36·5	50	16
9	White Giant	July	27	104	24	9	5½	840	24	24	33·7	49	7
10	Wide Awake..........	Aug.	2	110	24	9	5½	810	23	18	38	48	18
11	Twentieth Century.....	July	27	104	24	9	5	780	22	32	36·6	47	15
12	Pioneer...	Aug.	1	109	23	10	4½	720	21	6	33·5	43	30
13	Siberian.	"	1	109	22	9	5	570	16	26	33·6	43	24
14	Virginia White.......	July	25	102	24	9	5	720	21	6	37·5	43	1
15	Swedish Select........	"	25	102	22	9	5½	750	22	2	36·5	41	26
16	Thousand Dollar.......	Aug.	1	109	21	9	4½	540	15	30	39	39	4
17	Dodd's White..........	July	27	104	26	9	5½	780	22	32	39	....	
18	Victory	July	27	104	24	9	5	750	22	2	39	....	
19	Gold Rain	"	25	102	25	10	5	720	21	6	38	....	
20	Garton's 'Regenerated' Abundance..	"	25	103	24	9	5	570	17	22	35·8	....	
21	Sixty Day.	"	14	91	20	9	4½	420	12	12	33	....	

RATES OF SEED PER ACRE.

The size of the plots used was one-twentieth acre each and they were all sown April 16. The land was summer-fallowed in 1909. The variety used was Banner in 1910 and 1909. In 1908, Tartar King was used.

OATS (non-irrigated)—Rates of Seed per Acre.

Rate of Seed per Acre.	Date Ripe.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs.	Aug. 7	17	2	32	12
30 "	" 2	22	12	43	31
45 "	July 26	22	32	46	29
60 "	" 25	25	10	50	13
75 "	" 25	27	2	48	21
90 "	" 25	25	10	50	..
105 "	" 23	21	26	48	21
120 "	" 23	20	20	42	19

Notwithstanding the apparent irregularity in the averages, due no doubt to the factor of experimental error, it would appear that about seventy-five pounds would not be far from the right amount of seed to sow per acre under our conditions.

FIELD LOTS OF OATS.

The following field lots of oats were sown on summer-fallow at the rate of about two bushels and one peck per acre.

Variety.	Area.	Date Sown.	Date Ripe.	Yield per Acre.	
	Acres.			Bush.	Lbs.
Abundance	0·28	May 7	Aug. 5	24	23
Improved American	0·30	" 7	" 5	24	..
Irish Victor	0·30	" 7	" 5	20	3
Banner	2·65	" 9	" 5	20	6
Banner	11·72	" 6	" 5	18	6

EXPERIMENTS WITH BARLEY.

Eleven varieties of six-row and ten varieties of two-row barley were grown on summer-fallowed land. They were all sown April 19 at the rate of a little less than one bushel and three pecks per acre.

Six-Row Barley (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bu.	Lbs.	Lbs.	Bush.	Lbs.
1	Claude..........	Aug. 12.	105	19	9	2¾	570	11	42	44·8	36	8
2	Mansfield.......	" 13.	106	19	9	2¾	480	10	..	48·1	33	32
3	Odessa.......	" 8.	101	18	9	3½	600	12	24	45·5	30	26
4	Mensury........	" 12.	105	17	10	4	510	10	30	45	26	38
5	Stella........	" 12.	105	17	9	3½	390	8	6	48·5	26	37
6	Albert..........	" 18.	111	15	9	4	360	7	24	45·4	26	32
7	Nugent.........	" 18.	111	18	9	4	300	6	12	38·6	25	15
8	Yale..........	" 12.	105	19	8	3½	420	8	36	48	24	31
9	Trooper........	" 12.	105	18	8	3½	450	9	18	39·9	24	4
10	Oderbruch	" 12.	105	18	8	3½	360	7	24	40·5	23	46
11	O.A.C. No. 21.	" 8.	111	18	8	3½	570	11	42	40	...	......

Two-Row Barley (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bu.	Lbs.	Lbs.	Bush.	Lbs.
1	Swedish Chevalier	Aug. 15.	108	18	10	4	570	11	42	50·7	37	..
2	Invincible	" 31.	124	16	8	3½	510	10	30	48·3	34	41
3	Canadian Thorpe	" 24.	117	16	9	4	510	10	30	49	32	27
4	Standwell.......	" 15.	108	15	8	3½	450	9	18	50·5	31	15
5	Clifford	" 13.	106	18	9	4	750	15	30	49·5	29	23
6	Danish Chevalier	" 31.	124	16	9	4½	480	10	..	45·5	27	27
7	French Chevalier	" 24.	117	17	9	4	300	6	12	50	26	12
8	Jarvis..........	" 15.	108	20	10	4½	420	8	36	49·5	24	8
9	Beaver.	" 12.	105	19	9	4½	450	9	18	44	21	31
10	Hannchen	" 1.	94	18	10	4	780	16	12	48·5	....	

RATES OF SEED PER ACRE—(NON-IRRIGATED).

The size of the plots used was one-twentieth acre each and they were all sown May 2 on summer-fallowed land. The variety used was Mensury.

BARLEY (non-irrigated)—Rates of Seed per Acre.

Rate of Seed.	Date Ripe.	Yield in 1910.		Average Yield for two years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs	Aug. 15....	7	44	4	28
30 "	" 15....	7	44	5	20
45 "	" 13....	10	..	15	..
60 "	" 13....	10	20	17	44
75 "	" 12....	11	12	22	04
90 "	" 12....	11	22	22	39
105 "	" 8....	10	30	23	11
120 "	" 8....	8	16	21	42

WINTER BARLEY.

A small plot of winter barley was sown on August 25, 1909. A good stand was obtained in the fall but, with the exception of an occasional plant, it all winter-killed.

EXPERIMENTS WITH PEAS.

Thirteen varieties of peas were sown. Nine of these were mixed in the field after cutting, by a severe wind storm, in spite of the fact that they had been carefully staked to prevent any shifting. The remaining four plots are here reported on. The plots were sown April 2, at the rate of about two or two and a half bushels per acre, depending on the size of the pea. The land was summer-fallowed in 1909. The plots were one-sixtieth of an acre each.

PEAS (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.	Inches.	Lbs.	Bush.	Lbs.
1	Mackay...........	Medium..	Aug. 23..	112	18	$2\frac{3}{4}$	810	13	30
2	Gregory..............	" ..	" 26..	115	20	$2\frac{1}{2}$	720	12	..
3	Paragon..............	" ..	" 23..	112	19	$2\frac{1}{2}$	660	11	..
4	Black-eye Marrowfat..	Large ...	" 24..	113	17	$2\frac{1}{2}$	600	10	..

WINTER RYE.

A small plot of one-sixtieth of an acre of winter rye was sown September 10, 1909, on summer-fallow. It was ripe July 14. The length of straw including head was 37 inches. It yielded at the rate of 19 bushels and 16 pounds per acre.

INDIAN CORN AND ROOTS.

On account of the drought, seeds planted in May in almost every case failed to germinate. None of the corn came up and only a very scattering stand of roots was obtained. In the case of potatoes it was possible to plant them a little deeper, so that the sets were in contact with the moist soil below and consequently they all came up, but owing to the prolonged drought, only a very light crop was produced. The yield of roots, in each case, was estimated from the product of two rows, each sixty-six feet long.

EXPERIMENTS WITH TURNIPS (NON-IRRIGATED).

Ten varieties were sown on May 12, and a second sowing was made two weeks later. The latter sowing did not germinate and the seed of only two varieties germinated from the first seeding. The seed was sown in drills thirty inches apart and there was such a poor stand obtained that practically no thinning was necessary. The roots were pulled October 5. Halewood's Bronze Top yielded at the rate of 1,995 pounds per acre and Hall's Westbury 665 pounds per acre.

EXPERIMENTS WITH MANGELS.

Eight varieties were sown May 3, and a second sowing was made two weeks later. Practically none of the seed in the second sowing germinated. The stand obtained from the first sowing, the results of which are given, was poor. The seed was sown in drills thirty inches apart and the young plants were thinned out to ten or twelve inches apart in the row, although little thinning was required owing to the poor stand. The roots were pulled October 5.

MANGELS (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.	
		Tons.	Lbs.	Bush.	Lbs.
1	Half Sugar White	11	610	376	50
2	Perfection Mammoth Long Red	11	610	376	50
3	Selected Yellow Globe	10	1,280	354	40
4	Gate Post	8	1,290	288	10
5	Prize Mammoth Long Red	8	1,290	288	10
6	Giant Yellow Globe	7	1,960	266	..
7	Giant Yellow Intermediate	5	1,970	199	30
8	Yellow Intermediate	5	1,305	188	25

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown May 3, and a second seeding was made two weeks later. The seed of only three varieties germinated in the first seeding and none in the second. The seed was sown in drills twenty inches apart. The stand was so poor that thinning was practically unnecessary. The roots were pulled October 5.

CARROTS (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.—1st Sowing.		Yield per Acre.—1st Sowing.	
		Tons.	Lbs.	Bush.	Lbs.
1	Ontario Champion	1	970	49	30
2	White Belgian	1	970	49	30
3	Mammoth White Intermediate	0	1,980	33	..

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were planted on summer-fallowed land on May 3, and a second seeding was made two weeks later, but the later seeding did not germinate. Seed of one variety was supplied from the Knight Sugar Company of Raymond, and was planted May 12, but it failed to come up. This failure was, no doubt, due to drought and not from lack of vitality on the part of the seed. The seed was sown in drills twenty inches apart but a very poor stand was obtained from all three varieties. The roots were pulled October 5.

SUGAR BEETS (non-irrigated)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.—1st Sowing.		Yield per Acre.—1st Sowing.	
		Tons.	Lbs.	Bush.	Lbs.
1	Vilmorin's Improved	7	850	247	30
2	Klein Wanzleben	5	1,880	198	..
3	French Very Rich	5	890	181	30

EXPERIMENTS WITH POTATOES.

Fifteen varieties were planted on summer-fallowed land, in rows thirty inches apart on May 13. The potatoes for planting were cut into pieces with two or three eyes in each, although medium rather than large-sized potatoes were selected so as to avoid cutting as much as possible. They were dug October 6, and the yield was computed from two rows each sixty-six feet long in each instance. The potatoes were all sound, being affected with neither rot nor scab, but they were rather small, and those classed as marketable were not of a size to sell to the best advantage. They were dug October 6.

POTATOES (non-irrigated)—Test of Varieties.

Number	Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Reeves' Rose..........	147	24	134	12	13	12	Oval, pink.
2	Everett................	128	42	110	..	18	42	"
3	Vick's Extra Early....	125	24	112	12	13	12	Irregular, pink.
4	Gold Coin.............	119	54	104	30	15	24	Round and oval, white.
5	Carman No. 1.........	113	18	101	12	12	6	Oval, white.
6	Empire State..........	108	54	96	48	12	6	"
7	Dreer's Standard......	107	48	96	48	11	..	Round, white.
8	Late Puritan..........	106	42	93	30	13	12	Oval, white.
9	Irish Cobbler..........	103	24	86	54	16	30	Round, white.
10	Money Maker..... ...	101	12	85	48	15	24	Flat, oval.
11	Rochester Rose........	99	..	82	30	16	30	Oval, pink.
12	Morgan Seedling . ..	89	6	71	30	17	36	Irregular, pink.
13	American Wonder.....	86	54	66	..	20	54	Oval, white.
14	Ashleaf Kidney.......	77	..	63	48	13	12	"
15	Dalmeny Beauty......	55	..	37	24	17	36	Round, white.

POTATOES PLANTED AT DIFFERENT DISTANCES APART.

This experiment will be carried on for a number of years with the object in view of ascertaining the best distance apart to plant potatoes on non-irrigated land. The land was summer-fallowed the previous season. The yield was computed from three rows, each 73.5 feet long. The variety used was Gold Coin. The potatoes were cut as nearly uniform in size as possible, with at least two to three eyes to the piece, and the pieces averaged rather large so that the amount of seed used per acre may be somewhat greater than would have been the case had they been cut smaller. The total yield only is given; in future, the yield of marketable potatoes will be reported in addition.

POTATOES—Planted at different Distances Apart.

Distance apart of Rows.	Amount of Seed per Acre.		Total Yield per Acre.			
	Sets put 2ft. apart.	Sets put 1ft. apart.	Sets put 2ft. apart.		Sets put 1ft. apart.	
Feet.	Lbs.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
2½	1,185	2,370	113	23	111	23
3	987	1,974	113	48	106	37
3½	846	1,692	104	8	90	25
4	740	1,481	94	54	91	50

FORAGE CROPS.

On account of the extreme drought, none of the alfalfa, brome grass, Western rye grass, timothy or clovers made enough growth to be cut for hay. We were able to get a few pounds of alfalfa seed by cutting over four of five acres of alfalfa that had been planted in rows in 1908 and 1909, but the yield was of no particular value from a commercial standpoint, as less than thirty-five pounds of clean seed was obtained in all.

APPLE ORCHARD AND SMALL FRUITS.

There was more or less winter-killing in most of the apple trees, but some of the varieties came through with little injury. This was practically the case with all the cross-bred varieties. The currants and raspberries came through the winter in fair condition, but made only small growth during the summer on account of the dry weather, and no small fruit was produced.

SUMMARY OF CROPS GROWN EXCLUSIVE OF UNIFORM TEST PLOTS.

	Bushels.
Winter wheat	448
Spring wheat	69
Oats	287
Total	804

PART II.—THE IRRIGATED FARM.

The yields of grain on the irrigated farm were all relatively low, the principal cause for this being the high mean temperature during the months of April, May and June and the windy weather that prevailed during a good part of this time. The way the season turned out, to have obtained the best results it would have been necessary to irrigate the grain the latter part of May or early in June. This was a course we hardly cared to risk, for two reasons: First, because it injures grain to flood irrigate it in the spring before it is through stooling, and second, because, if the land had been flooded at this time and the usual rains had occurred, which almost invariably come at this season of the year, the grain would have been seriously injured by too much wet. In such a season it would be almost impossible to have obtained partic· large crops, no matter when the irrigation was done. Land that had been irrigated the previous fall was, of course, in much better condition to withstand the unusually dry conditions of the spring. But very little of our land was so treated.

WINTER WHEAT.

Two small fields of Kharkóv wheat were sown on summer-fallow on August 23, 1909. One was irrigated in the fall after the grain was up and the other was irrigated in the spring on June 13.

—	Area Acres.	Date Ripe.	Yield per Acre.	
			Bush.	Lbs.
Field fall irrigated	0·9	July 16	21	40
Field spring irrigated	1·0	" 21	18	5

It is very difficult to offer any explanation for the low yields of these two fields.

EXPERIMENTS WITH SPRING WHEAT.

Five varieties of spring wheat were grown on summer-fallowed land in plots of one-sixtieth acre each. They were sown on March 30 at the rate of about one bushel and one peck per acre. They received two irrigations, one on June 22 and the other July 13.

SPRING WHEAT (irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
1	Preston....	Aug. 11	132	28	9	4	1,500	25	..	62·3	36	12
2	Huron	" 18	139	27	9	4	1,590	26	30	63·6	35	20
3	Red Fife ..	" 8	129	31	10	3¾	1,740	29	..	62·5	33	28
4	Stanley....	" 13	134	31	9	4	1,380	23	..	60	26	35
5	Marquis. ..	" 8	129	28	9	3½	1,410	23	30	62·7		

SPRING WHEAT—RATES OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre; they were sown April 4, on land on which hoed crops had been grown the previous season. The land was not spring-ploughed, but was double-disced and levelled before the wheat was sown. The variety used was Red Fife. Two irrigations were given, one on June 15, and the other July 14.

SPRING WHEAT (irrigated)—Rates of Seed per Acre.

Rate of Seed per Acre.	Date Ripe.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs...	August 13	21	..	28	40
30 "	" 11	23	15	29	25
45 "	" 13	26	..	31	17
60 "	" 8	28	..	32	27
75 "	" 8	32	..	36	..
90 "	" 18	34	..	36	57
105 "	" 8	35	..	37	10
120 "	" 18	36	..	34	57

From the results for the past three years as given in the above table, it would appear that one bushel of spring wheat is not enough seed to sow on irrigated land to produce the best results under our conditions.

EXPERIMENTS WITH OATS.

Seven varieties of oats were grown on summer-fallowed land in plots of one-sixtieth acre each. They were sown on April 15, at the rate of about two bushels and one peck per acre. Two irrigations were given, one on June 22, and the other July 13.

Oats (irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre	Yield of Grain per Acre		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
1	Improved American	Aug. 11..	118	30	10	6	2,580	75	30	37	84	27
2	Banner....	" 11..	118	29	10	6	2,340	68	28	39	78	11
3	Irish Victor	" 18..	125	29	10	5½	2,340	68	28	38	78	1
4	Abundance	" 18..	125	29	9	5½	2,400	70	20	37·5	77	4
5	Danish Island.....	" 13..	120	27	9	5½	2,460	72	12	39	75	..
6	Dodd's White...	" 13..	120	28	10	6	2,040	60	..	40	..	..
7	Sixty Day..	" 6..	113	22	9	4½	1,282	37	24	35·6	..	..

Field Lots of Oats.

Variety.	Area.	Preparation of Land.	Date Sown.	Date Ripe.	Yield per Acre.	
	Acres.				Bush.	Lbs.
Banner..............	1·0	In hoed crops previous season...	April 16...	....	82	31
Banner..............	5·0	June breaking..............	" 18...	Sept. 15...	45	20
Banner..............	7·1	Stubble, spring ploughed........	" 18...	" 18...	28	04

The one acre field was irrigated on June 15 and on July 14. The other two fields were irrigated June 17-18 and July 19-20. The very light yield of the field sown on stubble was largely due to the fact that the grain was suffering in a very severe manner before the first irrigation was given on June 17 and 18.

OATS—RATES OF SEED PER ACRE.

In the following experiment, the size of the plots used was one-twentieth acre; they were sown April 15 on land on which hoed crops had been grown the previous season. The land was not spring-ploughed but was double-disced and levelled before the oats were sown. The variety used was Banner. Two irrigations were given, one on June 15, and the other July 14.

OATS—Rates of Seed per Acre (irrigated).

Rate of Seed per Acre.	Date Ripe.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs.......	Aug. 13....	55	20	68	45
30 "	" 13....	61	..	67	13
45 "	" 8....	56	16	67	31
60 "	" 8....	67	32	74	43
75 "	" 8....	70	20	77	37
90 "	" 8....	86	16	81	03
105 "	" 8....	86	16	82	49
120 "	" 8....	88	08	78	52

EXPERIMENTS WITH BARLEY.

Four varieties of six-row and four varieties of two-row barley were grown on summer-fallowed land, in plots of one-sixtieth acre each. They were all sown April 29, at the rate of a little less than one bushel and three pecks per acre. Two irrigations were given, one on June 22 and the other on July 13.

SIX-ROW BARLEY (irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
1	Claude..........	Aug. 18..	111	25	9	2¾	2,040	42	24	48·0	55	16
2	Mansfield.......	" 13..	106	25	9	2¾	1,800	37	24	50·0	48	29
3	Odessa..........	" 12..	105	23	9	2¾	1,440	30	..	50·5	45	12
4	Mensury.......	" 18..	111	27	9	4	1,200	25	..	48·5	38	31

TWO-ROW BARLEY (irrigated)—Test of Varieties.

Number.	Name of Variety.	Date of Ripening	Number of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Yield of Grain per Acre.	Yield of Grain per Acre.		Weight per measured bushel after cleaning.	Average Yield for three years.	
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
1	Swedish Cheval'r	Aug. 23..	116	28	9	4	2,580	53	36	52	61	12
2	Standwell	" 22..	115	26	9	2¾	2,080	43	16	50·5	59	11
3	Invincible......	" 23..	116	25	9	2½	2,080	43	16	51·3	..	..
4	Clifford.........	" 18..	111	30	10	3½	1,320	27	24	51·5	..	..

FIELD LOTS OF BARLEY (irrigated)

Variety.	Area.	Preparation of Land.	Date Sown.	Date Ripe.	Yield per Acre.	
	Acres.				Bush.	Lbs.
Standwell....	0·22	In hoe crops previous season.	May 7 .	Sept. 9...	48	37
Mensury............	1·4	Summer-fallow....	June 4....	" 13 ..	32	44

The Standwell barley was irrigated June 15 and July 14. The Mensury was irrigated June 22 and July 13.

BARLEY—RATES OF SEED PER ACRE.

In the following experiments, the size of the plots used was one-twentieth acre; they were sown May 2 on land on which hoed crops had been grown the previous season. The land was not spring-ploughed, but was double-disced and levelled before the barley was sown. The variety used was Mensury. Two irrigations were given, one on June 15 and the other on July 14.

BARLEY—Rates of Seed per Acre (irrigated).

Rate of Seed per Acre.	Date Ripe.	Yield in 1910.		Average Yield for three years.	
		Bush.	Lbs.	Bush.	Lbs.
15 lbs..	Aug. 13....	32	24	34	48
30 "	" 11....	32	24	37	24
45 "	" 11....	42	24	41	39
60 "	" 11....	45	..	43	36
75 "	" 11....	30	..	39	18
90 "	" 13....	30	..	38	27
105 "	" 8....	23	36	33	29
120 "	" 12....	28	16	36	49

The irregularities that are shown this year, both in regard to the date of ripening and the yields, are rather confusing, but may in part be due to the fact that the plots germinated somewhat unevenly on account of the drought. A good stand was obtained in each case, but the grain did not all come up at the same time.

EXPERIMENTS WITH PEAS.

Thirteen varieties of peas were grown on summer-fallowed land in plots of one-sixtieth of an acre each. They were sown April 2, at the rate of about two and one-half bushels per acre, depending on the size of the pea. The crop received two irrigations, one on June 2 and one on July 13.

PEAS (irrigated)—Test of Varieties.

Number.	Name of Variety.	Size of Pea.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield of Grain per Acre.	Yield of Grain per Acre.	
					Inches.	Inches.	Lbs.	Bush.	Lbs.
1	Paragon	Medium	Aug. 11	131	32	3	3,000	50	..
2	Mackay	"	" 8	128	30	3	2,460	41	..
3	Gregory	"	" 13	133	34	2¾	1,950	32	30
4	English Grey	"	" 13	133	28	3	1,860	31	..
5	Arthur	"	July 26	115	24	3	1,860	31	..
6	Daniel O'Rourke	Small	Aug. 6	126	28	2½	1,620	27	..
7	Black-eye Marrowfat	Large	" 11	131	32	3½	2,070	34	30
8	White Marrowfat	"	" 6	126	34	3¼	1,920	32	..
9	Prince	"	" 6	126	27	3	2,040	34	..
10	Chancellor	Small	July 26	115	24	2½	1,950	32	30
11	Golden Vine	"	" 26	115	28	2¾	1,500	25	.
12	Picton	Large	Aug. 6	126	26	2¾	2,100	35	..
13	Prussian Blue	Medium	July 26	115	25	3	1,680	28	..

INDIAN CORN.

On account of the drought, none of the corn that was planted germinated, except that put in the garden, which was duly irrigated and came up promptly.

EXPERIMENTS WITH FIELD ROOTS.

The stand obtained was very poor in the case of all the roots, on account of the severe drought. The yields reported should not be taken as a criterion of what may be expected from irrigated land in ordinary seasons when the land and crop are given reasonable care. It is very rare indeed in southern Alberta that any difficulty is experienced in getting seeds of any kind to germinate readily when planted during the month of May. The writer has been farming for the last ten years in the Lethbridge district and during that length of time he has never before failed to get a good stand of all seeds sown during the month of May; even small seeds, such as grass or alfalfa, sown on the surface and harrowed in have always come up well. In fact, during normal years, May and June are our wettest months.

PREPARATION OF THE LAND.

The land on which all the roots were planted received, in the spring of 1909, an application of fresh manure at the rate of about twelve tons per acre. The manure was disced in at once and the land was ploughed and summer-fallowed.

EXPERIMENTS WITH TURNIPS.

Ten varieties of Swede turnips were grown. The seed was sown in drills thirty inches apart, and as such a poor stand was obtained, owing to the drought, it was not necessary to do any thinning. The first sowing was made May 12, and the second May 26. From the great irregularity in yields, it can be seen that uneven germination has probably had more to do with the difference in yields than any peculiar qualities possessed by the varieties themselves. The roots were pulled October 5, and the yield per acre estimated from the product of two rows—each sixty-six feet long. The crop received four irrigations, July 12, 21, 30 and August 11.

TURNIPS (irrigated)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.—1st Sowing.		Yield per Acre.—1st Sowing.		Yield per Acre.—2nd Sowing.		Yield per Acre.—2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hartley's Bronze	17	580	576	20	1	1,325	55	25
2	Good Luck	9	1,950	332	30	..	1,330	22	10
3	Halewood's Bronze Top	7	1,960	266	..	2	1,985	99	45
4	Bangholm Selected	7	630	243	50	1	1,325	55	25
5	Jumbo	6	1,300	221	40	7	630	243	50
6	Perfection Swede	3	650	110	50	1	660	44	20
7	Carter's Elephant	2	1,985	99	45	1	1,325	55	25
8	Magnum Bonum	2	1,985	99	45	1	660	44	20
9	Mammoth Clyde	1	1,990	66	30	2	655	77	35
10	Hall's Westbury	......	......	......	......	5	1,305	188	25

EXPERIMENTS WITH MANGELS.

Eight varieties of mangels were grown. The seed was sown in drills thirty inches apart but such an extremely poor stand was obtained that practically no thinning was necessary. The first sowing was made May 4, and the second sowing two weeks later. The crop received four irrigations, July 12, 21, 30 and August 11. The roots were pulled October 5. The yield per acre is estimated from the product of two rows, each sixty-six feet long.

MANGELS (irrigated)—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.—1st Sowing.		Yield per Acre.—1st Sowing.		Yield per Acre.—2nd Sowing.		Yield per Acre.—2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Prize Mammoth Long Red	24	1,875	831	15	3	1,049	117	29
2	Giant Yellow Intermediate	24	1,210	820	10	..	..	..	..
3	Half Sugar White	23	683	778	3	5	906	181	46
4	Perfection Mammoth Long Red	22	1,220	753	40	1	1,990	66	30
5	Gate Post	20	1,895	698	15	1	1,990	66	30
6	Yellow Intermediate	20	1,230	687	10	1	260	37	40
7	Giant Yellow Globe	18	1,240	620	40	..	..	..	..
8	Selected Yellow Globe	17	580	576	20	1	1,325	55	25

EXPERIMENTS WTH CARROTS.

Five varieties of carrots were grown. The seed was sown in drills twenty inches apart. The stand obtained was so poor that practically no thinning was necessary. The first sowing was made May 4, and the second sowing two weeks later. The crop received four irrigations, July 12, 21, 30, and August 11. The roots were pulled October 5. The yield per acre was estimated from the product of two rows, each sixty-six feet long.

CARROTS (irrigated)—Test of Varieties.

Number	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 2nd Sowing.		Yield per Acre. — 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	White Belgian	6	1,860	231	..	2	1,148	85	48
2	Mammoth White Intermediate..	3	930	115	30	..	....	..	..
3	Half Long Chantenay..........	3	930	115	30	..	....	..	..
4	Improved Short White..........	1	970	49	30	..	1,980	33	..
5	Ontario Champion...	1	970	49	30	..	....	..	..

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were grown. The seed was sown in drills twenty inches apart but such a poor stand was obtained that practically no thinning was necessary. The first seeding was made May 4, and the second sowing two weeks later. The roots were pulled October 5. The yield per acre was estimated from the product of two rows, each sixty-six feet long. The crop was irrigated four times, on July 12, 21, 30, and August 11.

SUGAR BEETS (irrigated)—Test of Varieties.

Number	Name of Variety.	Yield per Acre. — 1st Sowing.		Yield per Acre. — 1st Sowing.		Yield per Acre. — 2nd Sowing.		Yield per Acre. — 2nd Sowing.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Klein Wanzleben............	16	1,660	561	..	..	..	..	..
2	Vilmorin's Improved............	14	710	478	30	2	950	82	30
3	French Very Rich	12	750	412	30	..	..	..	..

EXPERIMENTS WITH POTATOES.

One of the most satisfactory crops grown the past season on the irrigated farm was the potato crop. On the summer-fallowed land on which they were planted there was plenty of moisture in the soil below the first two or three inches, so, as they were planted in moist ground, no difficulty was experienced in getting a good stand.

There is an impression more or less general in the district that potatoes grown with irrigation are apt to lack in quality; that when cooked they are inclined to be soggy or watery and less mealy and dry than are potatoes raised without the aid of irrigation. That there are grounds for this belief cannot be denied, for, if the crop is irrigated in a careless manner and too much water is applied, the resulting crop is almost sure to be poor in quality, as just pointed out. However, by using reasonable care and intelligence, this trouble may be easily avoided. To begin with, the land should be in good tilth. There is probably no better preparation than to summer-fallow the land the season previous to when the potatoes are to be planted. If an application of manure could be given before the land is ploughed for the summer-fallow, so that it would have a chance to rot during the summer, the yield of the following crop would be materially increased. Another quite satisfactory method is to manure the land in the spring and then raise a grain crop to be cut for green feed. This will leave the land relatively clean for the potatoes. As soon as a farmer on an

irrigated farm has enough alfalfa seeded down so that he can afford to break up a four or five year old field to plant his potatoes on, he will have a field that will be certain to give large returns.

As indicated above, to avoid the possibility of producing potatoes of poor quality, care must be exercised as to when and how the crop is irrigated. It probably requires more skill and experience to raise potatoes successfully under irrigation than any other crop commonly grown here at the present time. The secret appears to lie in being able to keep the plants growing vigorously from the beginning with no set-backs, and on the other hand in being able to apply the water so that too sudden growth will not be stimulated at any time. If possible, the first irrigation should not only be very light, but it should not be given until the small potatoes are set and are perhaps the size of peas. This stage is usually about the time the first blooms appear. If the crop is wet before this time there is danger of the plants setting more potatoes than they will be able to develop to a marketable size. To be sure that the potatoes are not wet too much when the first irrigation is given, it is well to run the water between every alternate row only and turn it off just as soon as it gets through so as not to let the ground soak up any more than is necessary. As soon as the ground dries sufficiently, the land should be given a shallow cultivation. About ten days after the first irrigation, the second should be given. This time, the water may be run down between all the rows and should be allowed to remain running until the land is well wet. After irrigation has once begun, the land should never be allowed to dry out completely. Unless heavy showers intervene, it will be found necessary in order to maintain this condition to irrigate about every ten days. After each irrigation, as soon as the surface of the soil dries sufficiently, it should be given a shallow cultivation. If, for any reason, after irrigation has once begun, the land is allowed to become relatively dry, the potatoes should not again be irrigated, for, if they are, a second growth is almost certain to be induced, and this will injure the quality, for the main cause of soggy potatoes being produced when grown under irrigation is from allowing the land to become somewhat dry so that the growth is checked and then applying and inducing a fresh growth of roots and tops.

POTATOES (IRRIGATED)—TEST OF VARIETIES.

Fifteen varieties of potatoes were planted May 13 in rows thirty inches apart, the sets being placed about one foot apart in the rows. The land was prepared the same as for the turnips and mangels, etc. The potatoes for planting were cut in pieces with two or three eyes to each, although medium rather than large-sized potatoes were selected, so as to avoid cutting as much as possible. The crop was irrigated five times, July 12, 21, 30, and August 11 and 20. They were dug October 5. Anything smaller than a good-sized hen's egg was classed as unmarketable. There was no rot or scab among the potatoes dug. The yield was calculated from the product of two rows, each sixty-six feet long.

POTATOES (irrigated)—Test of Varieties.

Number.	Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Vick's Extra Early	583	..	528	..	55	..	Flat, white.
2	Gold Coin	578	36	545	36	33	..	Round, white.
3	Reeves' Rose	563	12	545	36	17	36	Long, pink.
4	Carman No. 1	554	24	528	..	26	24	Flat, white.
5	Morgan Seedling	552	12	509	18	42	54	Long, pink.
6	American Wonder	528	..	492	48	35	12	" white.
7	Rochester Rose	526	54	486	12	40	42	" pink.
8	Irish Cobbler	521	24	508	12	13	12	Flat, white.
9	Dreer's Standard	501	36	462	..	39	36	Oval, "
10	Empire State	479	36	457	36	22	..	Long, "
11	Ashleaf Kidney	455	24	433	24	22	..	Oval, "
12	Money Maker	446	36	433	24	13	12	Round, "
13	Dalmeny Beauty	442	12	374	..	68	12	Oval, "
14	Everett	436	42	385	..	51	42	Long, pink.
15	Late Puritan	435	36	407	..	28	36	" "

OTHER PLANTINGS OF POTATOES—(IRRIGATED).

The preparation of the land was the same as for the variety test. The sets were put a foot to sixteen inches apart in the rows which were thirty inches apart. The treatment in the way of irrigation, etc., was about the same as for the variety test. The area of each plot planted varied from one-tenth to one one-hundredth of an acre.

Variety.	Date Planted.	Yield per Acre.	
		Bush.	Lbs.
Gold Coin	May 19	546	..
Rochester Rose	" 21	463	40
Irish Cobbler	" 21	455	.
Early Ohio	" 19	384	..
Butter	" 13	235	37
Hard to Beat	" 13	266	57

FORAGE CROPS.

ALFALFA—(IRRIGATED).

There is no crop that we know of that can be grown on irrigated land in Southern Alberta with more profit than can alfalfa. If cut promptly, as soon as the very first blooms appear, three cuttings can be obtained in each season. After a field is once seeded down, it continues to produce year after year with no deterioration. In fact, the crop improves each year for about three seasons. Besides producing large returns annually as long as desired, it has the happy faculty of improving the soil by adding nitrogen and humus so that any time the field is ploughed it is in excellent condition for any crop that may be planted upon it. It has a most important place in a locality where sugar beets are grown, for there is no treatment that prepares the land in such a way as to increase the tonnage of beets as will the growing of this forage crop for a

few years. During the time it is thus preparing the land for an increased yield of beets, it is producing a crop that ranks in cash returns very close to the sugar beet. For dairying and stock feeding, there is no other hay that quite equals alfalfa.

Although alfalfa, after it is once well established, is a strong, vigorous grower, it is quite tender when young and considerable care should be exercised in preparing the land so that a good stand may be obtained to start with. One or two grain or other crops should have been taken off the land. The sods should be all rotted and the native grasses should be all worked out of the ground. Although it is not wise to sow it on non-irrigated land except on summer-fallow or where hoed crops have been grown the previous season, it is quite feasible to sow on fall or spring-ploughed stubble where the land is to be irrigated. After the ground is ploughed a good fine seed bed should be prepared. Before seeding, the land should be inoculated by taking some soil from an old alfalfa field and scattering over the field, and then harrowing it in. One hundred pounds of soil is sufficient for one acre but one hundred and fifty to two hundred pounds can be spread over easier. On the payment of one dollar, a sack of this soil will be shipped to any farmer in Southern Alberta from the Station and the freight on the same will be prepaid to the applicant's nearest railway station. Soil from an inoculated alfalfa field that has been growing in a thrifty manner for two seasons may be used to inoculate other fields.

The seed should always be sown alone, never with a nurse crop, and during the latter part of May. On irrigated land about twenty pounds of seed per acre, on non-irrigated land, from ten to twelve pounds of seed per acre, should be sown. Further space will not be taken up here in giving details in regard to the growing of this plant, but a circular dealing with the matter quite fully will be mailed free to any one applying for the same.

ALFALFA—RATES OF SEED PER ACRE—(IRRIGATED).

The following fields were sown in June, 1908, and the average results for the last two seasons are here given. They were irrigated twice, on June 8, and on August 4. In the fall, after growth had about ceased, the fields were again irrigated so that they might go into the winter wet and so insure rapid growth the first thing in the following spring. The first cutting was made June 20, the second July 26, and the third September 19.

ALFALFA—Rates of Seed per Acre (irrigated).

Rate of Seed.	First Cutting.				Second Cutting.				Third Cutting.				Total for Season.			
	Yield in 1910.		Average for two years.		Yield in 1910.		Average for two years.		Yield in 1910.		Average for two years.		Yield in 1910.		Average for two years.	
Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
5 lbs.....	1	1,720	1	1,780	2	320	2	660	1	1,080	1	650	5	1,120	5	1,090
10 " ...	2	680	2	440	2	840	2	1,060	1	1,360	1	1,200	6	880	6	700
15 "	2	600	2	640	2	440	2	950	1	1,400	1	1,290	6	440	6	890
20 "	2	720	2	460	2	360	2	1,020	1	840	1	1,030	5	1,920	6	510
25 "	2	360	2	180	2	480	2	940	1	880	1	1,080	5	1,720	6	200
30 "	2	520	2	400	2	320	2	920	1	1,400	1	1,300	6	240	6	620

In connection with the results given in the above table, it should be mentioned that an excellent stand was obtained on all the fields when the seed was sown in 1908. The seed bed was in prime condition, and timely rains came immediately after the

seeding was done, so that practically every seed sown came up. As a rule, such conditions cannot be relied upon, so five or ten pounds of seed do not always give as good a stand as was here obtained. Observation and experience in this district would indicate that it pays to sow about twenty pounds of seed per acre on irrigated land.

A field of 2.8 acres of alfalfa sown in 1908 was irrigated June 8, August 4 and October 5 and yielded as follows:—

—	Date Cut.	Yield per Acre.	
		Tons.	Lbs.
First cutting	June 21	1	1,630
Second cutting	July 26	1	1,705
Third cutting	September 19	1	500
Total for season		4	1,835

A field of 3½ acres was seeded in 1909. It was irrigated June 10, July 2 and not again till after the third cutting. The fact of it not being irrigated after the second cutting accounts for the very light third crop.

—	Date Cut.	Yield per Acre.	
		Tons.	Lbs.
First cutting	June 22	1	1,490
Second cutting	August 3	2	480
Third cutting	September 19		920
Total for season		4	890

Another small field of .89 acres was seeded in 1909. It was irrigated June 13 and August 2.

—	Date Cut.	Yield per Acre.	
		Tons.	Lbs
First cutting	June 22	1	1,925
Second cutting	July 25	1	1,860
Third cutting	September 14	1	1,320
Total for season		5	1,105

MIXTURE OF GRASSES AND ALFALFA.

Where alfalfa is sown with a mixture of grasses such as timothy, rye grass, etc., the hay can be cut only twice during the season instead of three times, owing to the fact that the grasses are not ready to cut until some time in July, which allows time for only one more cutting to come on, while alfalfa when grown alone must be cut the first time about June 25 if three cuttings are desired. After the grasses have been cut in July, they make little growth, so that the second cutting is practically pure alfalfa. The following table gives the results of three plots of one-quarter acre each, sown in 1908. They were irrigated twice in 1910, on June 10 and August 5, and again in the fall, on October 3. The first cutting was made on July 13 and the second cutting August 24.

MIXTURES OF GRASSES AND ALFALFA.

	First Cutting.				Second Cutting.				Total for Season.			
	Yield in 1910.		Average for two years.		Yield in 1910.		Average for two years.		Yield in 1910.		Average for two years.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Alfalfa and Brome grass*..	3	680	..	..	2	1,840	..	..	6	520	..	..
Alfalfa and Timothy......	3	880	2	1,250	2	1,400	2	160	6	280	4	1,410
Alfalfa and Rye grass.....	3	1,800	2	1,800	2	1,720	2	780	6	1,520	5	580
Alfalfa, Timothy and Rye grass	3	1,880	2	1,910	2	1,880	2	1,160	6	1,760	5	1,070

* The record of yield in 1909 was lost owing to an error in harvesting.

VARIETIES OF ALFALFA.

In the spring of 1909, seed of fourteen varieties or strains of alfalfa were planted that were received from the United States Department of Agriculture, Washington, D.C. These were supplied by the courtesy of Mr. J. M. Westgate, Agronomist, Division of Forage Crop Investigations. The following table gives the results for the past season. They were irrigated June 13 and August 12, but, unfortunately, the second irrigation was not very thorough, which probably accounts for the low yields in the second crop in some of the plots. The first cutting was made June 21, the second cutting July 25, and the third September 14.

Size of Plot.	Name and Number.	First Cutting. Yield per Acre.		Second Cutting. Yield per cre.		Third Cutting. Yield per Acre.		Total for Season. Yield per Acre.	
Acre.		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1-10	24859 Kansas Hardy	2	600	1	900	1	1,200	5	700
1-10	23454 Montana......................	2	600	1	250	1	1,400	5	250
1-10	24837 Canadian (Variegated).........	2	300	1	550	1	1,400	5	250
1-40	23203 from Werny, Turkestan (very severe winters)	2	800	1	600	1	400	4	1,800
1-10	Turkestan from Ottawa...............	2	600	1	300	1	600	4	1,500
1-10	23394 Sand Lucerne..................	2		1	300	1	1,000	4	1,300
1-40	22788 from Aulieata, Turkestan (severe winters)........................	2	400	1	..	1	800	4	1,200
1-40	22790 from Kiva, Turkestan (mild winters..........................	2	400	1	600	1	..	4	1,000
1-10	24836 Canadian (Purple Flowers). ...	1	1,900	1	150	1	900	4	950
1-10	23396 Sand Lucerne................	1	1,900	..	1,850	1	600	4	350
1-10	21032 Turkestan.....................	1	1,700	..	1,950	1	550	4	200
1-40	22789 from Tschimkent, Turkestan (average winters)..................	2	200	..	1,600	1	400	4	200
1-10	25102 Grimm	1	1,650	..	1,850	1	650	4	150
1-40	25022 Old Frankish Lucerne.........	1	1,600	..	1,600	1	400	3	1,000

Third cutting of Alfalfa on irrigated land, September 10th, 1910.

Seed Alfalfa cut with binder. Non-irrigated land, October 1909.

RED CLOVER (IRRIGATED).

A plot of 1-41 acre of Red Clover was sown in 1908. It was irrigated twice on June 8 and August 4.

Date Cut.	Tons.	Lbs.
First cutting July 20. Yield per acre	2	100
Second cutting October 5. Yield per acre	2	100
Total	4	200

INOCULATION TEST WITH CLOVER (IRRIGATED).

That it is necessary to inoculate the land to get the best results with alfalfa in southern Alberta has been quite conclusively demonstrated, so it is not surprising to find that Red Clover requires the same treatment. It might be well to mention, however, that the bacteria that work on the roots of clover are quite distinct from those that live on the roots of alfalfa, so that the soil from an alfalfa field would not be suitable to use to inoculate land on which Red Clover was to be sown.

To test the effect of inoculation with Red Clover, three plots of about two square rods each were seeded down without a nurse crop in 1909. The following table gives the results of the first cutting in 1910 expressed in yield per acre. By the time the second cutting was ready to be made, no difference in the appearance of the plots could be noticed. The germs had no doubt been distributed by the irrigation water, as the plots were quite small and were adjacent to each other. By the time the second crop was ready, all three plots appeared to be equally good so they were all cut together and yielded at the rate of 2 tons and 750 pounds per acre.

Inoculation Tests with Clover.

No. of Plot.	—	First Cutting — Yield per acre.	
		Tons.	Lbs.
1	Inoculated with clover soil from Cardston	2	144
2	Inoculated with nitro-culture	1	592
3	Check, not inoculated	..	1,988

TIMOTHY (IRRIGATED).

As yet we have only one plot of one-fourth acre of straight timothy. This was sown in 1908. It was irrigated at the same time as were the mixtures of grasses and alfalfa. It was cut July 13. The yield was at the rate of 2 tons and 140 pounds per acre.

BROME GRASS (*Bromus inermis*).

One-fourth acre of Brome grass was sown in 1908. It was irrigated at the same time that the mixture of grasses and alfalfa were, and was cut July 13. It yielded at the rate of 2 tons and 160 pounds per acre. The second growth would have made excellent pasture, but it was not heavy enough to warrant cutting for hay.

WESTERN RYE GRASS (*Agropyrum tenerum*).

One-fourth acre of Western Rye grass was sown in 1908. It was irrigated at the same time as the Brome grass and was also cut on the same day. It yielded at the rate of 2 tons and 1,780 pounds per acre. No second growth came on, as was the case with the Brome grass.

Summary of crops grown exclusive of uniform test plots (irrigated)—

	Bush.
Wheat (winter)	38
Oats	430
Barley	75
	543
	Tons.
Hay, alfalfa	41
Hay, mixed	8½
	49½

ORCHARDS AND SMALL FRUITS (IRRIGATED).

There were a few varieties of apples that wintered with no apparent injury although most of them were more or less killed back, some, in fact, clear to the roots. On the whole, however, the results with the young trees are rather encouraging.

The currants and raspberries came through the winter in very fair condition but no fruit was produced except in the case of the latter where some of the raspberry canes had a few berries. In the growing of raspberries, it has been found that the canes should be bent down and covered with earth to protect them during winter but more particularly to keep them from drying out. For in our dry, open winters, the canes are very apt to become quite dry and, if they do, they are almost sure to die down to the ground. Bending down and covering with earth prevents this. Manure does not make a satisfactory substitute for the earth.

STRAWBERRIES.

Every farmer should have a small patch of strawberries, for they can be easily grown in southern Alberta, especially where they can be irrigated. It is two or three years after a plantation of raspberries or currants are put out before they come into bearing but, in the case of strawberries, they can be set out in the spring and the following year a good crop may be obtained. Probably the most satisfactory way for a farmer to set a bed is to put the rows about three and one-half feet apart and set the plants eighteen to twenty-four inches apart in the rows. Let the runners form a matted row about a foot to a foot and one-half wide. The land on which they are put should be very rich. Give them thorough cultivation and irrigate often enough to keep the plants growing vigorously. In the fall, about the time the ground is starting to freeze up, the bed should be mulched with straw or with old hay if it is free from grass or weed seeds. Never use manure to mulch them with. They should be allowed to bear only two years. After the second crop has been picked, the bed should be ploughed up, and replaced by a new one which should have been set out in the spring of the same season.

The strawberry plantation on this Station was set out in 1908, so this was the second bearing season, which is not as a rule as good as the first. As stated in last year's report, a rather uneven stand was obtained with most of the varieties, so that the report of the yield from the different varieties would not be of much value. We

find that the Senator Dunlap is one of the most vigorous and thrifty growers. The yield of fruit, as a whole, was not as good as last year, for, owing to the dry, windy weather that prevailed during the bearing season, it was difficult to get the berries to grow to their usual size.

TREES AND SHRUBS.

Several hundred of the ornamental shrubs were moved from the nursery to their permanent locations on the border plantation surrounding the Station, but many of them died on account of the very unfavourable conditions.

VEGETABLE GARDEN.

On the ordinary grain farm, the vegetable garden is too often neglected. In the hope of being able to offer a few suggestions that will be of help in reducing the hand work connected with a garden, and to encourage those farmers who would like to attempt more in this line than they have in the past, I will repeat what I said in my last year's report in connection with the laying out of the vegetable garden.

The different kinds of vegetables should be planted in rows far enough apart to allow a horse cultivator to be worked between them. The amount of land used is generally of little moment to the farmer, for at most it is a small area, so the rows for lettuce, onions, etc., may be put two feet apart. The larger-growing plants, such as peas and potatoes, etc., may be put three and one-half or even four feet apart. On land that cannot be irrigated, there is an added advantage in this, for it gives more space in which the roots may forage for moisture. The rows should be made somewhat long so that there need not be too much time lost in turning. It is not necessary that a full length row of any one kind be planted. For example, if the garden is six hundred feet long, any desired part of this length of row may be sown with lettuce; then, on the same row, as many feet of radish as required, and so on down the list of vegetables that one wishes to put two feet apart. By planting the garden in this way, it is possible, if a horse cultivator is used occasionally, to raise a lot of vegetables with very little hoeing and other hand work. Always give level cultivation and hill or bank the plants as little as possible, to avoid drying the land out.

IRRIGATING VEGETABLES.

What has been said about planting the garden in long rows is particularly important where irrigation is to be practised. The rows should always run up and down the fall of the ground so that the water will readily run down between the rows. When it is desired to give an irrigation, make a small trench between the rows, without throwing earth against the plants if possible, and then allow only a small stream of water to trickle down. Let it run until the ground is thoroughly saturated between the trenches, but do not allow the land to be flooded where the plants stand, for this causes the soil to bake and crust close around the plants, injuring them unnecessarily and quite often requiring an extra hoeing. Thorough irrigations are recommended rather than more frequent light ones. As soon as the land dries off sufficiently after each irrigation, a light cultivation should be given.

The usual assortment of vegetables were planted, but it was necessary to irrigate them all to induce germination. This is not only difficult to do, but is often quite unsatisfactory. For this reason, the material planted was slow in coming up, but still, on the whole, the results of the vegetable garden were quite satisfactory. On account of the gardener leaving in the middle of the season, the notes are in such an unsatisfactory condition that it will be impossible to attempt a report of the results that would be of much value. All the hardier vegetables such as lettuce, radish, spinach, cabbage,

cauliflower, turnips, beets, carrots, parsnips, peas, etc., did well. The various varieties of beans tested produced well and some of the earlier varieties ripened seed. None of the corn ripened seed, except the Squaw. The earlier sorts of sweet corn produced roasting ears. Only one variety of tomatoes was tested, Sparks' Earliana. The plants were well loaded with green tomatoes and a few were just beginning to ripen at the time of the frost. Some of the vines were pulled and hung in the cellar and quite a number of the green tomatoes ripened later on.

ASPARAGUS AND RHUBARB.

Every farm garden should contain some rhubarb and an asparagus bed, for they require very little care after they are once established, and the green stuff that they produce early in the spring is usually much appreciated by all.

The asparagus bed started in 1908 produced a little and another year will doubtless yield a very satisfactory quantity. The rhubarb did well.

FLOWERS.

The annuals did not do as well as usual. It was almost impossible to get the seed up that was planted in the open on account of the lack of the usual showers. Even those started in the hot beds and set out did not thrive as they usually do. The tulips put in the previous fall came through the winter quite satisfactorily, but the blooms were small. Among the perennials, the pæony, perhaps, gave the most satisfactory results.

HORSES.

Eight work horses and two drivers are kept on the Station. In addition to this, there is a four-year old colt and a three-year old filly, not yet broken.

CATTLE.

Two grade cows are kept to supply milk to the families on the Station.

MEETINGS AND CONVENTIONS ATTENDED.

I attended the National Irrigation Congress at Pueblo, Colorado, September 26 to 30, and the Dry Farming Congress at Spokane, Washington, October 3 to 6. I attended and addressed a number of seed fairs and institutes; among them might be mentioned Pincher Creek, Taber, Cleverville, Carmangay, Barons, Noble, Monarch, Warner and Stavely. I assisted at the short course schools held at Strathmore and Macleod, and acted as one of the judges and delivered an address at the Provincial Seed Fair at Lacombe. In January I gave an address on Alfalfa at the Saskatchewan Fairs' Association in Regina.

DISTRIBUTION OF SAMPLES.

A distribution of samples of winter wheat, potatoes and small packets of seedling trees was made from the Station, and the following material has been sent out or promised, up to March 31, 1911.

Three-pound bags of potatoes	833
Five-pound bags of winter wheat	13
Total number distributed	846

A considerable number of young forest and ornamental trees and shrubs were also sent out, amounting to 172 packages in all.

INOCULATED SOIL.

The number of applications for hundred-pound sacks of inoculated alfalfa soil that have been supplied or promised during the past year amounts to 130.

CORRESPONDENCE.

For the twelve months ending March 31, 1911, there were 2,600 letters received and 2,380 sent out, not including circulars and reports.

CULTURAL AND ROTATION PROBLEMS.

In conluding, it might not be out of place to point out very briefly the enlarged scope that is to be given this work on the Station with the object of obtaining more exhaustive data regarding cultural as well as rotation problems.

In connection with the cultural investigations, the following outline will give some idea of the lines of work that are being taken up.

1. *Prairie Breaking.*—Ploughing in the spring and sowing immediately with both grain and flax. Breaking different depths and at different times of the year, back-setting, etc.

2. *Depth of Ploughing.*—Ploughing different depths from three to eight inches. It will also include subsoiling.

3. *Summer-fallowing Treatment.*—Ploughing at different depths and at different dates, ploughing twice in the same season, etc.

4. *Stubble Treatment.*—Ploughing in autumn, in the spring and no ploughing, discing at cutting time and discing in the spring, etc.

5. *Seeding to Grass and Clover.*—Seeding with and without a nurse crop, on stubble, on summer-fallow, after hoed crops, etc.

6. *Breaking sod of Cultivated Grasses.*—Similar to the tests with prairie sod.

7. *Applying Barnyard Manure.*—Applying on stubble, on winter wheat, spring wheat, etc.

8. *Green Manuring.*—Ploughing under various green crops.

9. *Seed Bed Preparation.*

10. *Soil Packers.*—Comparing different styles.

11. *Depth of Seeding.*—From one to four inches.

12. *Commercial Fertilizers.*

13. *Underdraining.*

These experiments will require between four hundred and five hundred plots. Each plot will be one-fortieth of an acre in size.

In addition to these cultural experiments, the following rotation fields will be established. Each field will contain from one to two acres.

Rotation A.—Wheat continuously, year after year.

Rotation B.—1. Summer-fallow.
2. Grain.

Rotation C.—1. Summer-fallow.
2. Grain.
3. Grain.

Rotation T.—1. Summer-fallow.
2. Wheat.
3. Oats or Barley.
4. Summer-fallow to May, seeded to Alfalfa in rows.
5. Alfalfa hay.
6. Alfalfa Hay.
7. Alfalfa hay or pasture.
8. Summer-fallow.
9. Hoed Crop.
10. Wheat (manure).

Rotation M.—1. Summer-fallow.
2. Wheat.
3. Coarse grain (manure).
4. Summer-fallow.
5. Peas and Oats for hay.
6. Barley or Oats.

Rotation S.—1. Summer-fallow.
2. Hoed crop.
3. Wheat.
4. Summer-fallow.
5. Wheat.
6. Coarse grain.
7. Summer-fallow (manure).
8. Peas and Oats for hay.
9. Rye pasture.

IRRIGATED LAND ROTATIONS.

Rotation U.—1. Seeding Alfalfa.
2. Alfalfa hay.
3. "
4. "
5. "
6. "
7. Hoed crops.
8. Wheat.
9. Wheat or coarse grain.
10. Coarse grain.

Rotation V.—1. Alfalfa continuously.

METEOROLOGICAL REPORT.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.
1910.	Date.	Degrees.	Date.	Degrees.	Inches.	Hours.
April	25	87·9	15	17·0	0·28	247·8
May	7	91·5	1	18·8	0·79	278·7
June	26	93·7	1	31·0	0·53	339·0
July	17	98·9	12	33·5	0·09	360·6
August	1	91·5	24	30·0	1·07	242·6
September	15	84·0	25	22·0	2·014	197·5
October	9	76·5	27	12·0	0·595	172·6
November	2	65·0	27	-31·0	0·41	119·7
December	20	60·8	31	-15·0	0·94	82·4
1911.						
January	6	44·5	12	-45·2	0·70	101·9
February	27	49·0	23	-20·5	0·52	135·9
March	19	70·5	1	10·5	0·315	160·4
Totals					8·254	2,439·1

In the above ten inches of snow is computed as one inch of precipitation.

I have the honour to be, sir,

Your obedient servant,

W. H. FAIRFIELD,

Superintendent.

EXPERIMENTAL STATION FOR CENTRAL ALBERTA

LACOMBE, ALTA., March 31, 1911.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit to you the fourth annual report of the work of the Experimental Station for Central Alberta at Lacombe, Alta., for the past year.

The spring of 1910 opened early; seedings of wheat in the dates of sowing test and test of varieties and trial seedings of oats and barley were made on March 31. There was little growth during the first half of April, while night frosts made unfavourable conditions for alfalfa and winter wheat.

As the season advanced, growth was good, particularly on well-worked breaking of 1909 or summer-fallow of that year, well-worked. The rainfall for the season was less than usual and dry weather made it hard for those who, being newcomers, had not been long enough in the province to get their land in condition to meet a dry season by storing moisture through cultivation. From April 1 to August 15, 8·34 inches of rain fell at Lacombe.

All grain crops on the Station matured well and, as there was no frost to injure Indian corn till September 9, a fair crop of fodder corn was harvested. Notwithstanding the limited rainfall, yields of grain and roots have been good and in one or two instances almost phenomenal records have been established.

Fall work was retarded by rather early freezing, no work on the land being possible after November 1.

EXPERIMENTS WITH WINTER WHEAT.

As in 1909, winter wheat on breaking or on sod was able to withstand the continual thawing and freezing of the early spring better than the winter wheat sown on summer-fallow. All the varieties of winter wheat were sown on summer-fallow and were so badly spring-killed that it was not thought worth while leaving them. Turkey Red and Dawson's Golden Chaff varieties were sown on land ploughed out of timothy sod after the hay was cut in 1909. These varieties were used both in the tests as to dates of sowing and seeding at different quantities of seed per acre.

WINTER WHEAT—Quantities of Seed per Acre.

Variety.	Quantity of Seed.	Date Sown 1909.	Date Cut 1910.	Yield per Acre.		
	Bush.			Bush.	Lbs.	Oz.
Turkey Red	¼	Aug. 30	Sept. 8	15	5	10
″	½	″ 16	Aug. 31	27	33	12
″	¾	″ 16	Sept. 3	29	26	4
″	1	″ 16	Aug. 29	45	41	4
″	1¼	″ 16	″ 29	49	18	12
″	1½	″ 16	″ 18	50	48	12
″	1¾	″ 16	″ 18	52	30	..
″	2	″ 16	″ 29	53	11	4
Dawson's Golden Chaff	½	″ 16	Sept. 3	8	5	10
″ ″	¾	″ 16	″ 1	24	..	..
″ ″	1	″ 16	Aug. 29	31	30	..
″ ″	1¼	″ 16	″ 31	49	35	10
″ ″	1½	″ 16	″ 18	43	43	2
″ ″	1¾	″ 16	″ 22	28	43	2
″ ″	2	″ 16	″ 29	25	15	..

WINTER WHEAT—DATES OF SOWING.

Seedings of winter wheat of the Dawson's Golden Chaff and Turkey Red varieties were made on August 2 and at intervals of one week up to September 12. The work in this connection this year, as previously, would go to show that, under conditions of soil and moisture similar to those on this Station, the best time to sow winter wheat is about the middle of August.

WINTER WHEAT—Dates of Sowing.

Variety.	Date Sown 1909.	Date Cut 1910.	Yield per Acre.		
			Bush.	Lbs.	Oz.
Turkey Red	Aug. 2	Sept. 5	45	..	..
″	″ 9	Aug. 30	44	9	6
″	″ 16	″ 29	45	41	4
″	″ 23	Sept. 5	28	45	..
Dawson's Golden Chaff	″ 2	″ 2	10	41	4
″ ″	″ 9	Aug. 31	31	30	..
″ ″	″ 16	″ 29	31	30	..
″ ″	″ 23	″ 31	11	11	4
″ ″	″ 30	Sept. 1	15	33	12

SUGGESTIONS WITH REGARD TO CULTIVATION FOR WINTER WHEAT.

We believe that winter wheat is a crop which will receive more attention in the central and eastern sections of the province, as time passes. It is a desirable crop in that it distributes the year's labour, and does particularly well on breaking. The breaker should be followed by the packer and the packer by the disc. We find the disc to do more effective work immediately after the plough than if the discing be done a month or six weeks after the breaking. If breaking is handled in this way, the work can continue until about August 1, or just to give time to finish the preparation of the seed bed and get the seeding done about the middle of that month. While the amount of moisture present and the condition of the seed bed will have a bearing upon the quantity of seed that should be sown, yet possibly in average seasons from one bushel to a bushel and a peck will give satisfactory results.

EXPERIMENTS WITH SPRING WHEAT.

Twelve varieties of spring wheat were tested, ten of which were sown on March 31, and two on April 21, at the rate of about one and three-quarters bushels per acre. The land was top-dressed with barn-yard manure after the hay was cut in 1908. The hay crop in 1909 was cut and the land immediately packed, ploughed and disced thoroughly. Owing to the slow growth during the early part of the season, the length of time required to mature is longer than if the wheat had been sown on a later date. Of the varieties under test, Red Fife is probably the best where it can be counted on to mature. Next following is Marquis, combining the quality of the Red Fife with the early maturing characteristics of Huron and Preston. It is possible that Marquis will yet prove itself to be superior to Red Fife even for districts where Red Fife can be counted on to mature. For soils such as we have on this Station, Red Fife is not suitable and Marquis, Huron and Preston should be given the preference.

Each plot was one-sixtieth of an acre in size, and the soil was a black, clay loam. No rust occurred on any of these plots.

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including head.	Strength of Straw, on a scale of 10 points.	Average Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre		Weight per measured bushel after cleaning.
					Inches.		Inches.		Lbs.	Bu.	Lbs.	Lbs.
1	Huron....	Mar. 31.	Sept. 3.	156	48	10	4½	Bearded	5,964	69	35	63·5
2	Pringle's Champlain	" 31.	" 3.	156	50	9	4½	"	7,985	65	54	61·5
3	Preston..	" 31.	" 3.	156	47	10	4	"	8,109	65	50	61·0
4	Riga	" 31	Aug. 29.	151	44	10	3	Bald....	5,921	65	18	63·0
5	Red Fife..	" 31.	Sept. 7.	160	46	10	3¾	"	8,100	64	..	62·0
6	White Fife	" 31.	" 12.	165	51	10	3½	"	8,643	63	56	58·0
7	Stanley....	" 31.	" 3.	156	53	10	4	"	7,426	63	13	61·0
8	Bishop....	" 31.	" 4.	157	50	10	3½	"	6,429	60	50	62·3
9	Marquis..	" 31.	" 3.	156	45	10	4	"	5,911	59	28	63·0
10	Chelsea....	" 31.	" 3.	156	46	10	4	"	5,334	53	5	61·3
11	Century...	Apr. 21.	" 9.	141	59	10	3	Bearded	7,515	47	45	
12	'Regenerated' Red Fife....	" 21.	" 7.	139	46	10	3½	Bald...	5,910	47	30	

SPRING WHEAT—DATES OF SOWING.

The season was favourable for maturing late-sown grain, and the rains coming later than usual helped the late-sown plots to fill out. The Chelsea variety of spring wheat was used in this test, five sowings being made at intervals of one week, the first being March 31.

Variety.	Date Sown.	Date of Ripening.	Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acre.	
			In.		In.	Lbs.	Bus.	Lbs.
Chelsea............	Mar. 31..	Sept. 9..	46	10	4	5,334	53	5
"	Apr. 7..	" 5..	47	10	3½	4,263	53	56
"	" 14..	" 3..	47	10	3¼	5,096	60	3
"	" 21..	" 9..	49	10	3¾	5,898	55	41
"	" 28..	" 9..	49	10	3¼	7,278	63	41

SPRING WHEAT—QUANTITIES OF SEED.

The crops obtained in the experiments with different quantities of seed per acre have resulted in this instance in favour of the heavier seeding, not only with wheat but with oats and barley as well. The results of the past season support those of previous years and are in opposition to the theories advanced by a number of dry-farming experts of the western states. This work has now been conducted for more than one season, and the results are so uniformly in favour of what might be considered heavy sowing that we are forced to the conclusion that conditions in the province are so different as to warrant our farmers in following the advice of the light seeding advocates with extreme caution. It would be safer to use fairly liberal quantities of seed until proof has been given by a limited experiment on individual farms that lighter seeding will give better results. The uniformity of the results in favour of the heavier seeding indicates that, for this soil, it will pay to be generous in the use of seed.

Variety.	Bushels Seed per Acre.	No. of Days Maturing.	Length of Straw including Head.	Strength of Straw on a Scale of 10 Points.	Weight of Straw.	Yield per Acre.	
	Bush.		Inches.		Lbs.	Bush.	Lbs.
Marquis	$\frac{3}{4}$	156	47	10	5,670	45	30
"	$1\frac{1}{4}$	148	47	10	5,645	49	54
"	$1\frac{3}{4}$	149	49	10	5,769	58	50
"	$2\frac{1}{4}$	145	50	10	5,872	62	7
"	$2\frac{3}{4}$	144	47	10	6,018	63	41

SPRING WHEAT—TEST OF COMMERCIAL FERTILIZERS.

The results tabled below, while indicating that commercial fertilizer on spring wheat will increase the yields, particularly when the land has been cropped for a long time, are not conclusive, in that they do not demonstrate the most desirable combination of fertilizers. Another point to be noted is that the increase in yield was not sufficient to pay the cost of the fertilizer. It is possible, however, that benefits will accrue to succeeding crops from the application of fertilizer made this year.

Combinations.	Amount applied per Acre.	Cost of Fertilizer.		Yield per Acre.		Value of crop minus cost of fertilizer, when valued at 85c. per bush.	
	Lbs.	$	cts.	Bush.	Lbs.	$	cts.
Check plot				49	5	41	72
Acid phosphate	300	6	18	61	41	37	29
Muriate of potash	120	4	33				
Nitrate of soda	120	4	63				
Nitrate of soda	120	4	63	61	46	41	69
Acid phosphate	300	6	18				
Acid phosphate	300	6	18	61	16	41	36
Muriate of potash	120	4	33				
Muriate of potash	120	4	33	60	22	42	35
Nitrate of soda	120	4	63				

TEST OF SPRING WHEAT IN FIELD LOTS.

Four varieties were sown in field lots on fallowed land on April 5 and 9. The straw grew very heavy and all varieties, except the Huron, lodged badly. The yields were not as large as expected, judging from the growth of the straw.

Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Kind of Head.	Yield per Acre.	
	Acre.					Bush.	Lbs.
Huron...............	1·622	April 5......	Sept. 5.......	153	Bearded......	36	26
Preston.............	1·795	" 9......	" 8......	152	"	34	40
Chelsea.............	2·792	" 9.......	" 8.......	152	Beardless.....	33	19
Red Fife............	3·045	" 5......	" 9.......	157	"	23	51

EXPERIMENTS WITH RYE.

One plot of fall rye was sown on August 30, 1909, and one plot of spring rye on April 9, 1910. The soil and cultivation was similar to that for spring wheat. Seed was sown at the rate of one bushel per acre for the fall rye and about one and a half for spring rye. Fall rye has always proven hardy.

Variety.	Date Ripened.	No. of Days Maturing.	Length of Straw.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acre.	
			Inches.		Inches.	Lbs.	Bus.	Lbs.
Fall rye............	Aug. 9.....	344	54	9½	4	4,380	38	32
Spring rye..........	" 29.....	142	62	10	4	5,820	55	40

EXPERIMENTS WITH EMMER AND SPELT.

Plots of one-sixtieth of an acre each of Common Emmer and Red Spelt were sown April 22 at the rate of about one hundred and twenty pounds per acre. Until this year the yield of these grains here has not been satisfactory.

Variety.	Date Ripened.	No. of Days Maturing.	Length of Straw.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.
			In.		In.		Lbs.	Lbs.
Common Emmer..	Sept. 3.....	134	41	8½	2	Bearded....	5,760	2,700
Red Spelt........	" 5.....	136	44	10	4	Beardless...	5,400	4,020

EXPERIMENTS WITH OATS.

All experiments with oats were conducted on land top-dressed in 1908 after the hay was cut and ploughed out of sod after the hay crop of 1909 was harvested. As soon as the land was ploughed it was packed and thoroughly disced. The land on which the variety test was conducted was ploughed somewhat later than the land on which the dates of sowing and quantities of seed tests were carried on. The early ploughed land had greater opportunity for storing moisture, hence the larger yields in the dates of sowing and quantites of seed test as compared with the variety test. The seed was sown at the rate of about two and three-quarter bushels per acre, with the exception of 'Regenerated' Abundance which was sown at the rate of seven bushels per acre. Twenty-six varieties were tested and were sown on one-sixtieth acre plots on April 11. The soil was a black clay loam.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head	Strength of Straw on a scale of 10 points.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	White Giant.....	Aug.	29	140	37	10	10	Branching	3,180	88	8	39 0
2	Tartar King..................	"	22	133	41	10	8½	Sided	2,850	82	2	40·0
3	Swedish Select...............	"	22	133	41	10	8½	Branching	3,510	80	10	43·0
4	Abundance......	"	29	140	39	10	8½	" .	3,360	79	14	40·0
5	Banner......................	"	29	140	38	10	8½	" .	3,750	78	18	40·2
6	Danish Island..........	"	29	140	30	10	7	" .	3,480	77	22	41·0
7	Lincoln	"	29	140	37	10	8	" .	3,300	77	22	42·0
8	Thousand Dollar	"	22	133	41	10	8½	" .	2,940	75	30.	41·0
9	'Regenerated' Banner........	"	29	140	38	10	9	" .	3,600	75	30	40·5
10	Improved American........ ..	"	22	133	39	10	9	" .	3,210	73	8	43·4
11	Garton's 'Regenerated' Abundance (7 bush.).......	"	21	132	33	10	6	" .	3,330	73	8	40·0
12	Improved Ligowo............	"	22	133	40	10	8½	" .	3,180	72	12	44·0
13	Irish Victor.........	"	22	133	36	10	8½	" .	3,060	72	12	40·8
14	Twentieth Century...........	"	29	140	39	10	9	" .	3,120	70	20	38·5
15	Pioneer	"	22	133	34	10	9	" .	2,820	70	20	40·5
16	Virginia White..............	"	22	133	37	10	8	" .	2,630	70	20	42·2
17	Golden Beauty............	"	29	140	32	10	8½	" .	2,880	68	28	42·5
18	Siberian.....................	"	29	140	37	10	8	" .	3,330	67	32	40·0
19	Montgomery................	"	23	134	37	10	8½	" .	2,745	67	17	40·5
20	Bedrock.....................	"	22	133	34	10	7¾	" .	3,150	64	14	39·0
21	Alsasman..............	"	22	133	35	10	7¾	" .	2,790	64	14	40·7
22	Wide Awake....	"	23	134	35	10	8	" .	2,445	63	33	40·5
23	Gold Rain...................	"	23	134	36	10	8½	" .	2,760	56	16	44·5
24	Poland.....	"	9	120	36	10	9	" .	2,385	55	5	43·0
25	Dawson.......	"	11	122	38	10	9	" .	2,280	44	4	42.7
26	Orloff..............	"	9	120	27	10	6	" .	1,890	30	30	

OATS—DATES OF SOWING.

Banner oats were sown one week apart, the first seeding being made on March 31, continuing to May 12. The heaviest yield was secured from the plot sown April 28, which made 157 bushels 2 lbs. per acre. As has been noted previously, spring opened early but there was little growth until after the middle of April, which explains, to some extent, the reason the first-sown plot required thirty-three days longer to mature than the last sown.

OATS—Dates of Sowing.

Variety.	Date Sown.	Date Ripened.	No. of Days Maturing.	Weight of Straw.	Yield per Acre.	
				Lbs.	Bush.	Lbs.
Banner	Mar. 31	Aug. 29	151	5,280	125	10
"	Apr. 7	" 29	144	4,740	116	16
"	" 14	" 24	132	4,545	122	7
"	" 21	" 22	123	4,890	135	..
"	" 28	" 29	123	6,420	157	2
"	May 5	" 31	118	7,005	145	5
"	" 12	Sept. 7	118	9,240	141	6

OATS—QUANTITIES OF SEED.

Banner oats were sown at varying quantities of seed per acre. Each plot was increased one-half bushel and the range was from one to four and a half bushels per acre. Increasing the seed from one bushel to four and one-half decreased the number of days required to mature by ten and increased the yield by twenty-nine bushels per acre. The table shows a variation, but, taken in conjunction with results of previous years, from two and one-half to three and one-half bushels of seed per acre would appear to be about the right quantity for this kind of soil.

OATS—Quantities of Seed.

Variety.	Bushels Seed per Acre.	No. of Days Maturing.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acre.	
	Bush.			In.	Lbs.	Bush.	Lbs.
Banner	1	142	10	11	4,680	91	26
"	1½	141	10	10	5,595	100	5
"	2	140	10	10½	5,550	99	24
"	2½	139	10	10	6,135	137	7
"	3	134	10	9¾	4,410	110	10
"	3½	132	10	8½	5,010	129	24
"	4	132	10	8¼	4,860	134	4
"	4½	132	10	8½	4,980	128	28

OATS—CLEAN SEED.

Two plots of Banner Oats were sown side by side at the same rate of seed per acre and under the same conditions as to cultivation. One plot was seeded with grain as it came from the threshing machine well cleaned by the separator as far as broken straw or weed seeds was concerned. The seed for the other plot was put through the fanning mill twice.

OATS—Clean Seed.

Variety.	Date Sown.	Date Ripened.	Length of Head.	Strength of Straw on a Scale of 10 Points.	Weight of Straw.	Yield per Acre.
			In.		Lbs.	Bush. Lbs.
Banner (twice cleaned)	Apr. 22..	Aug. 29..	9	10	6,210	135 ..
" (uncleaned)	" 22..	" 29..	8½	10	5,880	128 28

OATS—TESTS OF VARIETIES IN FIELD LOTS.

Four varieties of oats were grown in field lots on land ploughed out of sod in 1909 after the hay was cut and given thorough fall working.

OATS—Tests of Varieties in Field Lots.

Variety.	Size of Lot.	Date of Sowing.	Date of Ripening.	Kind of Head.	Yield per Acre.	No. of Days Maturing.
	Acres.				Bush. Lbs.	
Banner	1·194	Apr. 19..	Aug. 20..	Branching	71 5	123
Danish Island	1·11	" 19..	" 20..	"	67 18	123
Ligowo	1·00	" 19..	" 18..	"	64 10	121
Thousand Dollar	1·22	" 19..	" 18..	"	52 19	121

16—p. 488.

Steers, Lacombe.

EXPERIMENTS WITH BARLEY.

Both the test plots and fields of barley were sown on timothy sod ploughed ter the hay was cut in 1909. The yields on the plots as well as from the fields were tisfactory. Seed was sown at the rate of about two and one-quarter bushels of x-row and two and one-half bushels per acre of the two-row varieties. The soil as a black clay loam with a clay sub-soil similar to that on which the other tests ere conducted. All varieties were sown on April 12, and the field lots on April 20.

Barley (Six-Row)—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head	Strength of Straw on a scale of 10 points.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Stella	Aug. 13	123	41	8½	3½	Bearded..	3,780	80	..	52·1
Guymalaye	" 4	114	31	9	2½	" ..	4,200	80	..	61·6
Claude	" 18	128	40	9½	3	" ..	2,925	79	3	48·6
O.A.C. No. 21	" 9	119	43	9	3¼	" ..	4,185	77	39	45·0
Odessa	" 9	119	37	7½	2¾	" ..	4,920	77	24	51·5
Yale	" 14	124	44	9	3	" ..	4,620	77	24	52·0
Albert	" 18	128	45	9	4½	" ..	4,410	73	6	48·0
Trooper	6 13	123	45	9	3½	" ..	4,320	71	12	49·0
Hulless	" 18	128	34	6½	2¼	Beardless.	3,540	67	24	64·5
Mensury	" 9	119	42	10	3½	Bearded..	4,800	63	36	48·5
Mansfield	" 9	119	42	10	3	" ..	3,210	63	6	51·8
Oderbruch	" 9	119	41	10	3¼	" ..	3,870	58	6	50·0
Nugent	" 9	119	42	10	3¼	" ..	4,080	53	36	48·3

Barley (Two-Row)—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head	Strength of Straw on a scale of 10 points.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Swedish Chevalier	Aug. 18	128	38	7	4¾	Bearded..	5,100	85	..	53·0
Hannchen	" 1[illegible]	120	38	9	3¾	" ..	3,900	83	36	54·0
Standwell	" 18	128	42	8	3	" ..	4,755	80	45	54·0
Invincible	" 19	129	39	9	3½	" ..	4,800	75	..	
Canadian Thorpe	" 18	128	40	9	4½	" ..	4,200	68	36	53·1
Danish Chevalier	" 14	124	47	9½	4½	" ..	4,590	49	18	53·0
Clifford	" 13	123	46	10	4¼	" ..	4,380	47	24	53·1
French Chevalier	" 18	128	47	10	3¾	" ..	5,235	47	9	54·1
Jarvis	" 18	128	50	9½	5	" ..	5,325	45	15	51·5
Beaver	" 13	123	52	9	5½	" .	7,050	44	18	48·6

BARLEY—DATES OF SOWING.

Mensury and Invincible barleys were sown at intervals of one week commencing rch 31 and continuing to May 12. Because of the late rains and the fact that frost not interfere with the maturing of the late-sown seed, the latest sown plots gave

this year the largest yields. This is not to be taken to mean that barley may safel be sown late. Too many farmers, working on the idea that barley may be sown a leisure after every thing else has been put in, have not only harvested a smaller cro in average years on account of the late sowing, but have exposed the crop to frost fro which earlier-sown barley would have been harvested and out of danger. The aver age of our results would indicate that the order in which the different grains should b sown for largest yields is wheat, barley and oats.

Variety.	Date Sown.	Date Ripened.	No. of Days Maturing.	Length of Straw.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acr	
				Inches.		Inches.	Lbs.	Bush.	Lbs.
Mensury	Mar. 31	Aug. 18	140	44	10	3½	4,020	66	42
"	April 7	" 14	129	43	10	3½	4,110	63	6
"	" 14	" 13	121	42	10	3½	4,680	73	36
"	" 21	" 13	114	41	9½	3½	5,130	81	42
"	" 28	" 13	107	41	8½	3½	5,550	91	42
"	May 5	" 29	116	42	8	3½	6,330	101	42
"	" 12	" 31	111	43	7½	3	7,140	103	36
Invincible	Mar. 31	" 31	153	44	10	4	6,360	60	..
"	April 7	" 22	137	41	10	3¾	4,890	63	6
"	" 14	" 18	126	41	10	3¾	5,580	61	12
"	" 21	" 22	123	44	9½	4	5,745	79	3
"	" 28	" 24	118	43	10	3¾	5,985	81	27
"	May 12	Sept. 2	113	44	8½	4	7,520	85	..

BARLEY—QUANTITIES OF SEED PER ACRE.

Mensury and Invincible barleys were sown on the same day and under the sam conditions at rates of seed per acre varying from one bushel up to three bushels pe acre, each plot being increased one-half bushel. Attention is called to the effect o heavy seeding upon the length of time required to mature—a most important factor.

Variety.	Quantity of Seed.	Date Ripened.	No. of Days Maturing.	Length of Straw.	Strength of Straw on a Scale of 10 Points.	Length of Head.	Weight of Straw.	Yield per Acr	
	Bush.			Inches.		Inches.	Lbs.	Bush.	Lbs.
Mensury	1	Aug. 18	128	47	9	5	4,260	77	24
"	1½	" 18	128	46	8½	4½	5,625	81	27
"	2	" 14	124	45	8	4	5,610	83	6
"	2½	" 13	123	46	8	4	5,535	83	21
"	3	" 9	119	44	8	3¾	5,520	88	36
Invincible	1	" 31	141	43	10	4½	5,415	48	21
"	1½	" 29	139	40	10	4¼	6,285	61	27
"	2	" 22	132	44	10	4	5,985	64	3
"	2½	" 22	132	45	9	3¾	7,140	81	12
"	3	" 18	128	50	7½	3½	6,450	80	30

BARLEY—TEST OF VARIETIES IN FIELD LOTS.

Three varieties of barley were sown in field lots on April 20 on land ploughed out of timothy sod in the summer of 1909.

Variety.	No. of Acres.	Date Sown.	No. of Days Maturing.	Yield per Acre.	
				Bush.	Lbs.
Mensury	2·33	April 20	129	54	44
Invincible (two-row)	1·33	" 20	129	52	31
Mansfield	2·03	" 20	111	51	26

TEST OF THE SOIL PACKER.

The surface soil packer was tried this year with wheat, oats and barley, the packer following the drill. This land was ploughed out of sod in 1909, all packed, disced and thoroughly worked. The cultivation given the plots was exactly the same, except for the once going over with the packer after the grain was sown. This is the fourth season during which the soil packer has been tested, and each year the results have been strongly in favour of its use. An average of the results would show an increased yield sufficient, on 100 acres of crop, to pay for the packer in one season with grain at average market prices. The large proportion of the land in Central Alberta is rich in humus and, when freshly turned by the plough, lies loosely with numerous relatively large spaces. The packer closes the majority of these air spaces by compressing the soil, thus preventing the too free circulation of air which would carry away with it large quantities of moisture. The advantage of using the packer immediately after the breaker or the plough (whether in fall or spring) is thus made apparent. The advantage of the use of the packer after the grain drill lies in the fact that the seed and soil are brought into close contact, that moisture promptly rises to the seed, that germination is more uniform and rapid, and that the young rootlets readily establish themselves in the firm soil. According to the 'Census and Statistics Monthly' for December, 1910, we had in the province of Alberta 1,722,000 acres under wheat, oats, barley, rye and flax. It is probably safe to say that not more than one-third of the area sown to these different crops was packed. If the use of the soil packer will increase the yields on this area by five bushels per acre (which, judging by results here, is a moderate estimate) the increased money return to the farmers of the province who do not pack their land, valuing wheat at 80 cents per bushel, barley at 40 cents and oats at 25 cents per bushel would be $2,492,867.

Variety.	Soil.	Date of Ripening.	No. of Days Maturing.	Weight of Straw.	Yield per Acre.	
				Lbs.	Bush.	Lbs.
Chelsea	Unpacked	Sept. 3	135	4,785	50	15
"	Packed	" 9	141	5,898	55	41¼
Banner	Unpacked	Aug. 22	123	4,110	131	16
"	Packed	" 22	123	4,890	135	..
Mensury	Unpacked	" 18	119	3,690	74	18
"	Packed	" 13	114	5,130	81	42

EXPERIMENTS WITH FIELD PEAS.

Fourteen varieties of field peas were tested at Lacombe in 1910. The seed was sown at the rate of from two and one-half to three bushels per acre, according to the size of the pea. The land was black clay loam ploughed out of timothy sod in 1909. In 1909, the pea plots were inoculated with soil from land on which had been successfully grown at Brandon, Man. As a result of that inoculation, the yield, though small on all plots, was doubled. Soil from the inoculated plots of 1909 was applied to all the pea plots this year which were one-sixtieth of an acre in size.

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Average Length of Straw.	Weight of Straw.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per measured bus. after cleaning.
						Inch.	Lbs.	Inch.	Lbs.	Bush.	Lbs	Lbs.
1	Prussian Blue........	Apr. 15.	Sept. 3.	141	Strong..	40	5,640	$2\frac{1}{3}$	2,580	43	..	63
2	Mackay......	" 15.	" 3.	141	Medium	37	4,440	$2\frac{3}{4}$	2,280	38	..	61
3	Early Harvest.......	" 28.	Aug. 29.	123	Fairly strong.	43	5,508	$2\frac{1}{4}$	$2,231\frac{1}{4}$	37	$11\frac{1}{4}$	63
4	Chancellor...........	" 15.	" 29.	136	Medium	43	4,080	2	2,220	37	..	64·5
5	Prince..............	" 15.	Sept. 3.	141	" .	36	4,110	$2\frac{1}{4}$	2,190	36	30	...
6	Picton..............	" 15.	" 3.	141	" .	40	4,500	3	2,100	35	..	62·5
7	Arthur.	" 15.	Aug. 30.	137	" .	49	3,517	$2\frac{1}{2}$	$2,002\frac{1}{2}$	33	$22\frac{1}{2}$	63·0
8	Black-eye Marrowfat	" 15.	Sept. 3.	141	Fairly strong.	37	4,845	3	1,995	33	15	62·0
9	White Marrowfat.....	" 15.	" 4.	142	" .	46	4,785	$2\frac{3}{4}$	1,995	33	15	62·5
10	English Grey.	" 15.	Aug. 29.	136	Medium	28	3,390	$2\frac{1}{4}$	1,890	31	30	60·0
11	Daniel O'Rourke.....	" 15.	" 30.	137	" .	37	4,305	$2\frac{1}{4}$	1,755	29	15	63·0
12	Golden Vine.........	" 15.	" 30.	137	Fairly strong.	39	3,990	2	1,590	26	30	63·6
13	Paragon....	" 15.	Sept. 3.	141	" .	46	5,310	$2\frac{1}{2}$	1,530	25	30	63·0
14	Gregory.	" 15.	" 10.	148	Strong..	60	5,220	3	1,500	25	..	....

ROTATIONS.

Of the following rotations, 'B,' 'C,' 'E,' and the check plots have been got under way this year, while 'A' and 'D' have been laid out and will be started in 1911.

ROTATION 'K.' SIX YEAR.

About 25 acres.

This rotation is to be located in an irregular area between the Canadian Pacific Railway and the Edmonton trail. The field is to be divided into six equal blocks by paralleling the north and south road allowance.

First year—Hoe crop, peas and mixed grains.

Second year.—Wheat.

Third year.—Oats and barley seeded down.
Part (*a*) Alsike clover 6 lbs., Rye grass 10 lbs.
Part (*b*) Alsike clover 6 lbs., Alfalfa 6 lbs. and Timothy 3 lbs.
Part (*c*) Red clover 6 lbs., Alsike 2 lbs., Timothy 2 lbs., and Western Rye grass 2 lbs.

Part (*d*)

Fourth year.—Hay, manure in autumn, 12 tons per acre.

Fifth year.—Pasture.

Sixth year.—Pasture, plough in July after haying or earlier in preparation for root crops.

ROTATION 'L.' SIX YEAR.

About 11 acres.

This rotation is to be located next to the north line and west of the north and south drive. The fields are to be about 1⅚ acres each.

First year.—Hay.
Second year.—Pasture, manure in autumn.
Third year.—Pasture, break in July for winter wheat or. . . . .
Fourth year.—Wheat or. . . . .
Fifth year.—Oats.
Sixth year.—Barley seeded down, Timothy 4 lbs., Alsike, 4 lbs., Red clover, 4 lbs.

ROTATION 'N.' SEVEN YEARS.

Ten acres.

This rotation is to be located west of the north and south drive and south of rotation 'L.' The fields are to be one acre each in extent.

First year.—Alfalfa seeded without a nurse crop.
Second year.—Alfalfa hay, manure six tons in autumn.
Third year.—Alfalfa hay.
Fourth year.—Alfalfa hay, manure six tons in autumn.
Fifth year.—Alfalfa, ploughed after first cutting.
Sixth year.—Winter wheat, or in case of failure, spring wheat.
Seventh year.—Grain (oats and barley). (Three acres of alfalfa to be left down permanently).

ROTATION 'O.' SEVEN YEARS.

About 29 acres.

This rotation is to be located south of the east and west drive and occupying the total block of 29 acres less rotation 'E.'

First year.—Roots, peas and oats, cut green and worked during fall.
Second year.—Wheat.
Third year.—Oats.
Fourth year.—Summer-fallow.
Fifth year.—Barley seeded down, alsike 2 lbs., alfalfa 6 lbs., and timothy 3 lbs.
Sixth year.—Hay, manure in autumn.
Seventh year.—Pasture, plough part intended for roots in July.

ROTATION 'C.' THREE YEAR.

Three Acres.

This rotation is to be located next to the south line and west of north and south drive. The fields are to be one acre each in extent.

First year.—Grain, wheat.
Second year.—Grain, wheat or coarse grains.
Third year.—Summer-fallow.

ROTATION 'V.'

1. Alfalfa, continuously. Located south of rotation 'N' and in same block.

ROTATION 'A.'

1. Grain, continuously. Oats will be grown on this plot without rest or manure, and the plot will be located in the triangle east of the railway and will be numbered 'A' in the check plots as below.

CHECK PLOTS.

Numbering A, K, L, N, O, C, from southeast corner of Station in triangle east of Canadian Pacific Railway from which Mr. Frank T. Shutt, Dominion Chemist, will make chemical determinations. All these plots will be in wheat in 1911.

COST OF PRODUCTION OF GRAIN CROPS.

The average yield per acre of all grain crops in Alberta is far below what should be produced on comparatively new land. A large amount of breaking is being done each year. In 1910 there was an increased area of 310,500 acres under crop. This area of new land bearing its first crop constituted almost one-fifth of the total acreage sown. The average yield of the three leading grain crops in Alberta in 1910 is given in the 'Census and Statistics Monthly' for December as follows:—

	Per Acre.
Wheat (winter and spring)	12·4 bushels.
Oats	24·27 "
Barley	20·32 "

Though the season of 1910 was unusually dry, much larger yields would have been secured if a good system of cultivation had been followed on every farm. The figures give no indication of the possibilities of the soil, but reveal the fact that many farmers give little thought to how they do their work or the cost of poor work.

As a means of increasing yield and at the same time reducing the cost of production, it is suggested that more attention should be given by farmers to determining that cost. The work necessary to determine the cost of producing crops would reveal the weak spots in the system being practised and make it possible to curtail losses and extend the business along the lines proving most profitable. To illustrate:—

As a result of our experimental work with the soil packer, we have found that by packing the land after the seed drill, at an additional expense per acre of twenty-five cents, we have been able to reduce the cost of producing oats by as much as two cents per bushel; in other words to fail to spend twenty-five cents per acre on certain cultivation, would mean a loss of three dollars and ninety-seven cents per acre. The very fact that a farmer sets about to know what it cost him to produce a bushel of grain would have a strong influence in preventing him from being an *average* farmer. It does not pay to be an *average* farmer. As is pointed out above, the average yield of oats in Alberta in 1910 was 24.27 bushels per acre. Our cost of producing oats on stubble land, figuring a man and a four-horse outfit at $6 per day, which is considered sufficiently liberal to cover depreciation in machinery, is as follows:—

Land rental	$1 60
Ploughing	1 20
Packing	0 25
Dragging twice	0 25
Seed, 3 bushels	1 05
Seeding	0 30
Packing	0 25
Harrowing after grain is up	0 12½
Cutting	0 50
Twine	0 25
Shocking	0 25
Threshing, 5 cents per bushel, yield 70 bushels	3 50
Delivery	1 40
	$10 92½

Cost to grow and sell yield of 70 bushels per acre is (per bushel) 15.6 cents.

Cost to grow and sell yield of 24·27 bushels per acre, threshing cost being $1.21 and delivery cost being 48 cents is (per bushel) 31.8 cents.

PEAS AND OATS AS A MIXTURE FOR GREEN FEED OR FOR CURING FOR HAY.

A plot of peas and oats was sown on April 21 at the rate of two bushels each of seed per acre. This was sown on land ploughed out of brome sod in 1909 after the hay crop was harvested. The growth of the crop was remarkable and illustrates what may be done in the way of supplying soiling crops throughout the summer for dairy cattle or other farm stock. The crop was cut on July 30 while still quite green, though far enough advanced to cure into hay of the best quality. The yield was at the rate of 25,440 pounds green which cured into hay of good quality at the rate of 12,360 pounds per acre.

EXPERIMENTS WITH ALFALFA.

In the spring of 1909, the following varieties of alfalfa were received from the Central Experimental Farm and sown on small plots side by side. After the ground had frozen in the fall of that year one hundred plants in each plot were counted out and surrounded by a cord so that the exact location of the plants counted could readily be determined the following spring. After growth commenced in the spring of 1910, the plants still living were again counted and a comparison of hardiness thus arrived at.

HARDINESS OF DIFFERENT STRAINS OF ALFALFA.

Name.	Number.	Per Cent. Living.
Medicago falcata	24,452	100
Grimm Alfalfa, from A. B. Lyman, Excelsior, Minn		95
Turkestan		92
Old Frankish Lucerne	25,022	69
Grimm Alfalfa	25,102	52
Canadian Alfalfa	24,836	36
Montana Alfalfa	23,454	24
Sand Lucerne	23,394	20

Unfortunately, the weights of the first cutting of these varieties are not available since the varieties were confused when hauling. The standing of the several varieties judged from the second cutting only is as follows: Grimm alfalfa (from A. B. Lyman, Excelsior, Minn.); Old Frankish Lucerne No. 25022; *Medicago falcata,* No. 24452; Montana alfalfa, No. 23454; Turkestan; Sand Lucerne, No. 23394; Canadian alfalfa, No. 24836 and Grimm alfalfa, tie.

COMPARING INOCULATED SOIL WITH CULTURE AS A MEANS OF INOCULATING FOR ALFALFA.

In the spring of 1909, two methods of inoculation were used with the Russian variety of alfalfa. A sample of Nitragin, manufactured by the Dr. Reiche Nitragin Co., Milwaukee, Wis., U.S.A., was carefully used according to instructions, while side by side was a block of alfalfa inoculated with soil taken from a field on which alfalfa had been successfully grown. This is the only culture which we have tried that has given any evidence of inoculating the land for alfalfa.

COMPARISON OF NITRO-CULTURE AND SOIL INOCULATION.

Variety.	Method of Inoculation.	First Cutting		Second Cutting.		Total.	
		Green.	Dry.	Green.	Dry.	Green.	Dry.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Russian	Soil	6,080	2,624	3,136	1,632	9,216	4,256
Russian	Culture	5,696	2,688	1,856	1,248	7,552	3,936

A block of alfalfa was sown in 1909, on which it was intended to run rotation 'C.' Five varieties were sown on this area from which two cuttings were taken in 1910. Cuttings were made July 18 and September 21. Owing to the dry weather, growth was slow to start after the first cutting. There was little growth after the second cutting and it is possible that all growth after the first cutting might better have been left. A narrow strip for comparison has been left and beside it another narrow strip which has been given no protection for the winter. All the rest of the alfalfa which was cut late has been top-dressed with barnyard manure applied with the manure spreader. It is believed that alfalfa can be successfully grown in this part of the province. In 1909 inoculated soil was sent to over 150 farmers living in all parts of the province north of Calgary. This spring after the crop had time to show by the character of its growth whether the inoculation was effective, letters of inquiry in regard to the appearance of the crop were sent to all those who had received soil. The majority of these men replied and of all those replying only one reported his alfalfa as being pale in colour and weak in growth as indicating the failure of the soil to effect inoculation. Judging from these results, farmers are recommended to undertake the growing of alfalfa, securing a hardy strain such as Turkestan and inoculating by means of soil from an old alfalfa field. Following are the yields in 1910 of the five different varieties grown under field conditions. When the high nutritive value of this crop is considered and the character of the past season remembered, the yields will be considered satisfactory.

Variety.	Method of Inoculation.	First Cutting.		Second Cutting.		Total.	
		Green.	Dry.	Green.	Dry.	Green.	Dry.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Russian	Soil	6,080	2,624	3,136	1,632	9,216	4 256
Turkestan	"	5,440	2,560	2,368	1,440	7,808	4,000
Sand Lucerne	"	3,648	1,920	2,816	1,472	6,464	3,392
Grimm	"	4,352	1,664	2,304	1,504	6,656	3,168
Canadian	"	3,904	1,664	2,816	1,504	6,720	3,168

GRASSES AND CLOVERS.

Hay was cut from the following varieties of grasses and clovers for the second time at this Station. The results are not altogether reliable as representing the merits of different varieties because the seed was variable and we did not get an even stand. Timothy and alsike appear to make a good mixture. Western Rye grass has also yielded well. Brome grass is not recommended except for land intended for permanent pasture. Once established, it is hard to eradicate. Timothy seed was sown too thickly on this block and even at the end of two years time it had become sod-bound. From four to five pounds of timothy seed per acre is thought to be sufficient.

Number.	Variety.	Yield of Dry Hay per Acre in lbs
1	Timothy and Alsike	4,042
2	Western Rye grass	2,631
3	Red Clover	2,547
4	Brome grass	2,522
5	Red Top	2,118
6	Kentucky Blue grass	1,823
7	Meadow Fescue	1,595
8	Orchard grass	1,548
9	Canadian Blue grass	1,374
10	Timothy	1,340

EXPERIMENTS WITH INDIAN CORN.

Eleven varieties of Indian corn were planted on May 19, on land top-dressed in 1908, and ploughed out of brome sod after the hay was cut in 1909. The seed was planted in hills two and one-half feet apart each way. Dry weather affected the growth of ears but a fair crop of fodder corn was harvested. The crop was cut on September 9.

INDIAN CORN—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Height.	Condition when Cut.	Weight per Acre grown in Hills.	
			Inches.		Tons.	Lbs.
1	Longfellow	May 19	71	Well tasseled.	21	1,327
2	White Cap Yellow Dent	" 19	67	Not tasseled	18	938
3	Golden Dent	" 19	62	"	17	1,196
4	Selected Leaming	" 19	73	Just tasseling	17	848
5	Angel of Midnight	" 19	66	Well tasseled	17	267
6	Northwestern Dent	" 19	70	"	16	1,686
7	Eureka	" 19	68	Not tasseled	16	176
8	Compton's Early	" 19	61	Commencing to tassel	15	201
9	Superior Fodder	" 19	72	Not tasseled	13	949
10	North Dakota No. 100 Dent.	" 19	61	Well tasseled	10	1,954
11	Davidson	June 14	56	Commencing to tassel	9	934

EXPERIMENTS WITH FIELD ROOTS.

All the root crops of 1910 were grown on clay loam ploughed in 1909, after brome hay was harvested and given thorough fall work. The dry spring interfered with the germination of mangels and carrots while the late rains were favourable to a good growth of turnips. The yields are computed from the weight of roots on two rows each 66 feet long and 30 inches apart.

TURNIPS.

Twelve varieties of field turnips were tested this year. Seed was sown in drills two and one-half feet apart and the plants were thinned out to ten or twelve inches apart in the row. The first sowing was made on May 26, and the second on June 9, and the roots were harvested on November 2.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hall's Westbury	May 26	June 9	Nov. 2	Nov. 2	31	1,096	1,051	36	19	676	644	36
2	Rennie's Prize (Rutabaga)	" 26	" 9	" 2	" 2	24	1,896	831	36	20	128	668	48
3	Mammoth Clyde	" 26	" 9	" 2	" 2	22	1,408	756	48	19	1,072	651	12
4	Jumbo	" 26	" 9	" 2	" 2	23	1,256	787	36	17	848	580	48
5	Hartley's Bronze	" 26	" 9	" 2	" 2	22	1,804	763	24	16	1,396	556	36
6	Derby Bronze Top	" 26	" 9	" 2	" 2	23	992	783	12	13	1,456	457	36
7	Halewood's Bronze Top	" 26	" 9	" 2	" 2	19	808	646	48	16	1,924	565	24
8	Good Luck	" 26	" 9	" 2	" 2	23	1,520	792	..	12	420	407	..
9	Magnum Bonum	" 26	" 9	" 2	" 2	21	1,824	730	24	13	1,984	466	24
10	Bangholm Selected	" 26	" 9	" 2	" 2	19	1,996	666	36	15	1,416	523	36
11	Perfection Swede	" 26	" 9	" 2	" 2	20	1,316	688	36	14	1,964	499	24
12	Carter's Elephant	" 26	" 9	" 2	" 2	21	900	715	..	11	1,100	385	..

CARROTS.

Five varieties of carrots were tested during the past season. Seed was sown in drills two and one-half feet apart and the young plants were thinned out to from five to seven inches apart in the row. The first sowing was made May 12, and the second May 26, and the roots were harvested October 11.

CARROTS—Test of Varieties.

Number.	Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	May 12	May 26	Oct. 11	Oct. 12	6	804	213	24	5	1,880	198	..
2	Mammoth White.....	" 12	" 26	" 11	" 12	5	1,880	198	..	3	1,920	132	..
3	White Belgian.. ...	" 12	" 26	" 11	" 12	3	1,920	132	.	4	712	145	12
4	Ontario Champion....	" 12	" 26	" 11	" 12	4	184	136	24	2	1,676	94	36
5	Half-Long Chantenay.	" 12	" 26	" 11	" 12	3	336	105	36	3	72	101	12

MANGELS.

Eight varieties of mangels were tested at Lacombe in 1910. The seed was sown in drills two and one-half feet apart and the young plants were thinned to from eight to ten inches apart in the row. The roots were pulled on October 11.

MANGELS—Test of Varieties.

Number.	Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Half Sugar White....	May 12	May 26	Oct. 11	Oct. 11	12	948	415	48	12	1,344	422	24
2	Selected Yellow Globe	" 12	" 26	" 11	" 11	10	1,912	365	12	13	1,192	453	12
3	Giant Yellow Globe..	" 12	" 26	" 11	" 11	13	928	448	48	10	1,384	356	24
4	Perfection Mammoth Long Red..........	" 12	" 26	" 11	" 11	9	84	301	24	11	1,100	385	..
5	Yellow Intermediate..	" 12	" 26	" 11	" 11	9	876	314	36	10	1,516	353	36
6	Giant Yellow Intermediate............	" 12	" 26	" 11	" 11	11	1,100	385	..	7	1,840	264	..
7	Prize Mammoth Long Red.............	" 12	" 26	" 11	" 11	8	500	275	..	11	308	371	48
8	Gate Post...........	" 12	" 26	" 11	" 11	9	876	314	36	6	936	215	36

SUGAR BEETS.

Three varieties of sugar beets were sown on land similar to that on which the mangels were sown and given similar cultivation. The seed was sown in drills two and one-half feet apart and from four to five inches was allowed each plant in the row. The dates of sowing and harvest were the same as for mangels and carrots. The sugar-content of these roots was not high. Analyses made by Mr. Frank T. Shutt, Dominion Chemist, Central Experimental Farm, showed Vilmorin's Improved to stand first with 13·4 per cent of saccharine matter.

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.	
						Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	French Very Rich. ...	May 12.	May 26.	Oct. 11.	Oct. 11.	6	1,728	228	48	7	1,708	261	48
2	Vilmorin's Improved..	" 12.	" 26.	" 11.	" 11.	6	1,728	228	48	6	1,332	222	12
3	Klein Wanzleben.	" 12.	" 26.	" 11.	" 11.	5	1,220	187	..	5	1,088	184	48

POTATOES.

The season of 1910 was a satisfactory one for the growth of the potato. The yields were good and the quality is the best so far grown here. The land was black clay loam, top-dressed in 1908 after hay harvest, ploughed out of brome sod in 1909, packed and thoroughly cultivated that fall. The potatoes were planted on May 17, and dug September 24, 26 and 27. For planting, the tubers were cut into pieces having from two to three eyes to the piece and were planted about twelve inches apart in the row, the rows being two and one-half feet apart. Frequent cultivation was given but the vines were not hilled. We have not been troubled with rot or the potato beetle, though it has made its appearance in certain parts of the province. Paris green, one teaspoonful to a pail of water applied by means of a sprayer, is a practical means for destroying the potato beetle.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Planted.	Dug.	Average Size.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable		Form and Colour.
					%	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Table Talk.	May 17.	Sept. 26.	Large ..	75	577	30	490	53	86	37	White, oval.
2	Holborn Abundance.	" 17.	" 26.	" ..	60	534	36	481	9	53	27	"
3	British Queen	" 17.	" 26.	Medium	80	524	42	446	..	78	42	"
4	Late Puritan.	" 17.	" 26.	Large ..	80	496	6	471	18	24	48	"
5	Pioneer............	" 17.	" 27.	" ..	75	485	6	436	36	48	30	"
6	Gold Coin..........	" 17.	" 27.	" ..	50	484	..	435	36	48	24	"
7	Empire State.	" 17.	" 26.	" ..	95	482	54	458	46	24	8	"
8	American Wonder ..	" 17.	" 26.	" ..	75	481	48	457	43	24	5	"
9	Carman No. 1.	" 17.	" 26.	" ..	60	467	30	444	8	23	22	"
10	State of Maine......	" 17.	" 27.	" ..	45	466	24	443	5	23	19	"
11	Uncle Sam.	" 17.	" 27.	" ..	80	465	18	442	3	23	15	"
12	Morgan Seedling....	" 17.	" 27.	" .	50	462	..	415	48	46	12	Pink, long.
13	Reeves' Rose.	" 17.	" 27.	" ..	65	427	54	385	7	42	47	Red, oval.
14	Country Gentleman.	" 17.	" 24.	" ..	65	426	48	384	8	42	40	White, long.
15	Dooley	" 17.	" 26.	" ..	75	422	24	405	31	16	53	White, oval.
16	Ashleaf Kidney.....	" 17.	" 24.	" ..	55	419	6	377	12	41	54	Pink, oval.
17	Twentieth Century..	" 17.	" 27.	Medium	60	407	..	345	57	61	3	White, oval.
18	Dreer's Standard....	" 17.	" 27.	Large ..	70	391	36	352	27	39	9	"
19	Irish Cobbler.	" 17.	" 27.	Medium	70	348	42	296	24	52	18	White, round
20	Vick's Extra Early..	" 17.	" 27.	Large ..	75	342	6	307	54	34	12	White, oval.
21	Money Maker	" 17.	" 27.	" ..	55	341	..	306	54	34	6	White, long.
22	Everett............	" 17.	" 27.	Medium	95	324	30	275	50	48	40	Red, oval.
23	Rochester Rose......	" 17.	" 24.	" .	70	319	..	255	12	63	48	Pink, long.
24	Dalmeny Beauty....	" 17.	" 26.	Large ..	90	315	42	284	8	31	34	White, long.
25	Uncle Gideon's Quick Lunch............	" 17.	" 27.	Small ..	50	171	36	128	42	42	54	White, round pink eye.
26	Factor.............	" 17.	" 27.	" ..	75	99	..	79	12	19	48	
27	Hard to Beat.	" 17.	" 27.	" ..	75	85	48	64	21	21	27	

APPLICATION OF COMMERCIAL FERTILIZER TO POTATO CROP.

Fertilizers were supplied by the Brackman-Ker Milling Co., Calgary, agents for the Canadian Potash Syndicate, Toronto, and were applied to a crop of the Ashleaf Kidney variety, results of which appear below.

Combination.	Amount applied per Acre.	Cost of Fertilizer.	Yield per Acre.		Value minus cost of Fertilizer when valued at 50c. per Bush.	Value minus cost of Fertilizer when valued at 35c. per Bush.
	Lbs.	$ cts.	Bush.	Lbs.	$ cts.	$ cts.
Check plot	....	....	330	..	165 00	115 00
Nitrate of soda	200	7 72	477	24	213 78	142 11
Acid phosphate	400	8 24				
Muriate of potash	250	9 02				
Acid phosphate	400	8 24	501	36	234 74	159 60
Nitrate of soda	200	7 72				
Muriate of potash	250	9 02	484	..	225 74	152 14
Acid phosphate	400	8 24				
Muriate of potash	250	9 02	371	48	169 16	113 38
Nitrate of soda	200	7 72				
Sulphate of potash	250	9 27	536	48	259 13	178 61
Muriate of potash	250	9 02	402	36	192 28	131 88

POTATOES—DEPTH OF PLANTING.

British Queen potatoes were planted two, four and six inches deep with the following results:—

Variety.	Total Yield		Yield per Acre. Marketable.		Yield per Acre. Un-marketable.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Br tish Queen, 1 inches deep	440	..	396	..	44	..
" 4 "	418	..	355	18	62	42
" 6 "	523	36	486	57	36	39

POTATOES—TESTING ADVISABILITY OF PLANTING AS SOON AS CUT.

British Queen potatoes were planted the same day the seed was cut, but a part of the seed was held over for two weeks and planted on the rows adjoining those of the same variety planted two weeks previous. The held seed was stored in sacks in a fairly light room.

Variety.	Total Yield		Yield per Acre. Marketable.		Yield per Acre. Un-marketable.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
British Queen, seed cut, planted at once	477	24	405	48	71	36
" " stood two weeks	376	12	312	12	63	57

POTATOES—Cut vs. Whole Seed—Large and Small.

Variety.	Amt. of Seed required per Acre. (Approximate.)		Yield per Acre.					
			Total Yield		Marketable.		Unmarketable.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Holborn Abundance—								
Small cut	15	2	514	48	489	4	25	44
Small whole	27	48	475	12	451	27	23	45
Large cut	23	23	479	36	455	38	23	58
Large whole	50	49	440	..	418	..	22	..

APPLE ORCHARD.

The spring of 1910 proved trying on all trees and quite a large percentage were destroyed. There are, however, in the orchard a number of crab apple trees and cross-breds which are making good growth. A few blossoms were produced, but none of the fruit set. The orchard was seeded with rape during the last of July, which will be a protection to the trees this spring should the snow go as early as it did in the spring of 1910.

SMALL FRUITS.

Owing to the fact that the small fruit plantations has an exposed location the high winds which prevailed to an unusual extent in the spring of 1910, injured the plantation considerably. The covering being left on the strawberries to hold back the blooming period caught large quantities of dust as it passed which smothered the vines. Only one picking of fruit was secured previous to the date of the annual excursion. The green berries were not given an opportunity to ripen. Judging the yield from the one picking secured, Haverland, Senator Dunlap and Beder Wood are the most promising sorts.

BUSH FRUITS.

The red, white and black currants gave a small crop of fruit, all of which was of good quality and large size. The following varieties were received from the Central Experimental Farm and set out in a permanent plantation:—

RED CURRANTS.

2. Large Red,
1. Benwell,
2. Wentworth Leviathan,
1. Champagne Red,
2. Large Bunch Holland,
1. Rankin's Red,
2. New Red Dutch,
2. Greenfield,
3. Red Grape,
3. Raby Castle,
3. Moore's Seedling,
3. Early Scarlet,
2. Wilder,
3. Red English.

WHITE CURRANTS.

1. White Pearl,
2. Large White,
1. White Cherry,
3. Verrier's White,
2. Eyatt's Nova,
2. Large White Brandenburg.

BLACK CURRANTS.

1. Ogden.

RASPBERRIES.

With the exception of Sunbeam, both raspberries and blackberries were badly winter-killed and we have no crop of fruit to report. The following varieties were received and planted:—

RASPBERRIES AND BLACKBERRIES.

21. Henry,
11. Hilborn,
20. Early King,
15. Muriel,
4. Kansas,
15. Cumberland,
11. Gregg,
20. Golden Queen,
10. Kansas Black Cap,
10. Conrath,
10. Palmer,
10. Taylor,
12. Eldorado,
8. Snyder,
10. Ancient Briton.

TREE PLANTING.

Manitoba Maples have been planted on two drives which divide the section of the Station west of the Calgary and Edmonton Trail, north and south and east and west. The boundary planting has been completed with the exception of the row of ornamentals on the south boundary and about one-quarter of a mile on the west line. Taken altogether, about four miles of trees were put out last spring, not including a wide wind-break to shelter the buildings on the north and west.

THE VEGETABLE GARDEN.

The early spring was not favourable for the growth of vegetables. The first planting was destroyed by high winds, and the second, while of good quality, was rather late. The following vegetables are named in the order of merit. The date of sowing and when first ready for use is given.

ASPARAGUS.

Two hundred plants of the Palmetto variety were received from the Steele, Briggs Co., Toronto, and planted in shallow trenches three feet apart, and the plants 18 inches apart in the trench. Good growth was made during the season.

BEANS—Sown May 16.

The variety Dwarf Wax Every Day was the best in quality. They were ready for use August 21. French Dwarf Matchless stood next as to quality and was ready for use July 28. On July 21 Early Edible Podded was in use and takes third rank as to quality.

BEETS—Sown June 22. (First sowing destroyed).

Egyptian. Quality good. In use September 17.
Nutting's Dwarf Red. Quality good. In use September 19.

BROCOLI AND BRUSSELS SPROUTS.

The early sown of these vegetables were destroyed by high winds and sand. The plants were replaced from the hotbed, on June 17, and were taken up October 22. The average weight of Early White Brocoli was 8 lbs., 14 ozs., and of Dwarf Improved Brussels Sprouts, 4 lbs., 10 oz.

CABBAGE—Sown in hotbed, March 28, transplanted June 17. (First transplanting from hotbed destroyed by wind).

Variety.	In Use.	Average Weight per Head.	
		Lbs.	Oz.
Early Jersey Wakefield	Sept. 10	7	8
Paris Market Very Early	" 15	5	..
Fottler's Improved Brunswick	" 20	8	1
Large Red Drumhead	Oct. 1	10	..

CARROTS—Sown June 22, pulled October 15. (First sowing destroyed).

Variety.	In Use.	Yield per Acre.	
		Bush.	Lbs.
Early French Horn	Sept. 25	52	48
Amsterdam Scarlet	" 25	110	..

CAULIFLOWER—Sown in hotbed March 28. Set in open May 26. (Destroyed and re-set June 17).

Variety.	In Use.	Average Weight.	
		Lbs.	Oz.
Early Snowball	Sept. 6	4	8

CELERY.

This seed was sown in the hotbed on March 28, and the plants were set in shallow trenches four feet apart and about six inches apart in the row, on May 30. The dry weather appeared to stunt the growth of the plants after transplanting, and in consequence practically all went to seed.

CORN.

The varieties of corn, Golden Bantam and Malakoff, were planted on May 16, and the Pocahontas on May 30, but none of the varieties advanced their corn to a stage fit for table use.

Vegetables, at Lacombe, 1908.

LETTUCE.—Sown May 16.

Wheeler's Tom Thumb. Ready for use, July 6.
Cos Trianon. Ready for use, July 6.
The variety Wheeler's Tom Thumb was slightly superior to Cos Trianon in texture and flavour, though the latter variety was also good.

ONIONS—Seeds sown April 6.

The variety Yellow Danvers was tested, but the high winds checked its early growth and, later, necks rather than bottoms were produced.

RADISH.—Sown May 14.

Only two varieties were tested, Forcing Turnip Scarlet for summer use which was ready for the table on July 1, and Black Spanish winter radish which produced a fair crop of roots of good quality.

TOMATOES.

Seed was sown in the hotbed on March 28, and as the plants were destroyed by sand after having been set out on May 27 the test of tomatoes came to an early termination.

RHUBARB.

We have a large number of varieties of rhubarb under test, and most of them have produced exceptionally heavy yields of good quality. Late this season a fungous disease made its appearance in the crown of a large majority of the hills. Two samples of the affected plants were forwarded to the Dominion Botanist, Mr. H. T. Güssow, Ottawa, for examination. The disease is first noticed by the leaves turning brownish-red, finally wilting, when the connection at the crown will be found in process of decay.

TURNIPS.

The variety Extra Early White Milan was sown on May 14, and was ready for use on July 31. They were very large and when harvested in the fall on October 15, yielded at the rate of 1,108 bushels 48 lbs. per acre.

SUMMARY OF CROPS—1910.

	Bush.	Lbs.
Wheat—		
4 varieties, 9·338 acres	287	
12 uniform test plots	12	
Oats—		
4 varieties, 4·538 acres	289	9
26 uniform test plots	30	
For feed, 16·139 acres	1,041	15
Barley—		
3 varieties, 5·669 acres	332	17
23 uniform test plots	25	25
For feed, 11 acres	279	11
Peas—		
14 uniform test plots	7	44

	Bush.	Lbs.
Potatoes—		
Three-quarters of an acre	345	54
Roots—		
One-half acre	243	
Mixed grain for feed—		
13·869 acres		31,004

	Tons.	Lbs.
Fodder corn—		
Three and one-half acres	50	
Hay—		
Timothy, 9 acres	12	785
Alfalfa, 10·82 acres	16	1,623
Mixed, 5 acres	6	378

THE FLOWER GARDEN.

The high winds of early spring were very hard on the first sown plants which had been transplanted from the hotbed into flats on April 28, and into the open on May 12. All of the first planting were destroyed and were replaced from the hotbed on May 23. Bloom was earlier this year notwithstanding this delay than in previous seasons and continued to October 15, with the exception of the Nasturtium which succumbed to frost on September 9. The seeds of Larkspur, Sweet Peas, Poppy and Mignonette were sown in the open.

ANNUALS.

Variety.	First bloom.
Antirrhinum	Aug. 1
Brachycome	July 15
Candytuft, Empress	" 10
Calendula	Aug. 1
Chrysanthemum	" 12
Dianthus	" 15
Eschscholtzia	July 28
Gaillardia	Aug. 12
Godetia	" 15
* Kochia	
Mignonette	July 15
Nemesia strumosa Suttoni	July 15
Pansies	" 1
Phlox Drummondi	" 20
Stocks	" 25

* Well suited for a background for a flower garden.

PERENNIALS.

Sweet William came into bloom July 10, and Larkspur July 15, and were quite attractive. Iris, of which we have a large number of varieties, produced only a fair amount of bloom, commencing June 15.

CANNAS.

The following varieties of cannas were received and planted, the only one of the lot blooming being the William Saunders, which flowered August 29.

3. Mrs. Kate Gray,
6. Wyoming,
7. Pennsylvania,
5. Louisiana,
3. Miss Berthine Brunner,
4. Rubin,
4. New York,
6. Indiana,
3. Queen Charlotte,
6. America,
4. Captain,
3. King Humbert,
2. William Saunders,
3. Jupiter.

DAHLIAS, TULIPS AND CROCUS.

The tulips and crocus did not amount to anything, very few growing in the spring and only one or two blooms being produced, these being the variety Cottage Maid (Tulip). The following dahlias were received and planted:—

Flossie,
Cannall's Gem,
Lady H. Grosvenor,
Capstan,
Standard Bearer,
Wm. Pearce,
Austan Cannell,
Gloriosa,
Evadne,
Blue Oban,
Kynesith,
Wm. Agnew,
Ernest Glasse,
Grand Duke Alexis,
Earl of Pembroke,
Empress of India,
Cycle,
Mrs. Moore,
Highland Queen.
Cuban Giant,
Sylvia,
Bon Ton.

A large collection of tulips were planted for bloom in 1911.

ROSES.

Twenty-two varieties of roses were received from the Central Experimental Farm in the spring of 1910 and planted in the perennial border. One of the hybrid perpetuals bloomed remarkably well, commencing July 12.

CATTLE.

Two registered Jersey heifer calves were purchased in July from B. H. Bull & Sons, of Brampton, Ont. These animals were winners of the first and second prizes at the Calgary Exhibition and are promising youngsters. The other two grade dairy cattle have done well during the year.

FEEDING FOR BEEF.

Last fall a carload of cattle were purchased with the object of feeding them during the winter, and securing further cost data relative to feeding cattle. In the winter of 1909-10 the first car fed gave good returns, showing an average profit on the eighteen head sold of $16.97 and made frozen wheat worth $1.28½ per bushel when marketed as beef, which, had it been marketed in the fall as grain, would have brought only 35 cents per bushel. The average profit is higher this year, though the cost of 100 lbs. gain is also higher. The increase in cost of producing gain may be because grain fed this year was sound and therefore chargeable against the cattle at full market price, and also due in part to the poor quality of hay which was fed.

The cattle secured for this year's trial were a good uniform lot, mostly rising four with a few rising three years. They did not represent any particular breed, though Shorthorn and Hereford blood predominated.

The last individuals were secured at the close of October and on November 1 the feeding of oat sheaves cured green, and hay was begun. One sheaf of green oats per head was fed daily till December 19, after which date one-half sheaf daily was allowed each animal. They had access to hay, water and salt at all times. Ice was prevented from forming on the water tank by means of a galvanized tank-heater. No shelter was provided other than that afforded by the corral fence and buildings as wind breaks. The cattle had no opportunity of getting under cover. During part of the feeding period they ran to a straw stack. On December 1 the feeding of chop was begun at the rate of two pounds per head per day. Every seven days two pounds per day was added to the ration until twelve pounds was reached. They stood at this rate for about three weeks when the grain was again increased, the increase being continued up to eighteen pounds per head per day. The chop consisted of two-thirds oats and one-third barley. The oats were valued at 32 cents per bushel and barley at 40 cents per bushel, which, after allowing 10 cents per hundred pounds for grinding, brings the cost of chop to practically 1 cent per pound. Hay was valued at $6 per ton which was more than the hay purchased this year was worth as it was cut and put up after the frost and late summer rains.

The only equipment used for these trials consists of feeding racks for hay, water tank and tank heater and grain tables.

The time cost for feeding hay and grain and pumping was 209 hrs. 20 min. The time cost for pumping alone was 117 hrs. 45 min., which could be reduced or even eliminated by use of a windmill or in cases where feeding yards are watered by springs. The cost of feeding hay does not include hauling, which would mean an additional 50 cents per ton for hauling well-cured hay for about a mile. Where racks holding several days' hay are provided, the time for feeding could be cut down as compared with the time cost here where fresh hay was put in racks once or twice daily.

No account is given in the tables of the labour cost or of the interest on the money tied up in cattle for 157 days. In the corral there is a large pile of splendid manure which is estimated to be worth fully twice the cost of labour and interest charges together. If any one should feel disposed to disallow this claim they are free to deduct the cost of labour ($36.62) and interest on money ($33.30) from the profits.

Towards the last of March various buyers were invited to bid for the load, and a number of very satisfactory bids were received.

The bid of 'P. Burns & Co., Ltd.,' submitted through their agent, Mr. W. F. Puffer, proved to be the highest and the cattle were accordingly sold to that firm, delivery being made April 7.

The following statement gives full data in regard to this trial:—

No. steers in lot		20
Gross weight weighed in	lbs.	26,416
Average weight per head weighed in	"	1,320
Number days on feed		157
Gross weight weighed out April 7	lbs.	31,085
Average weight weighed out April 7	"	1,554
Total gain in 157 days	"	4,669
Average gain per head	"	233·9
Average daily gain per head	"	1·48
Average cost per 100 lbs. gain		$11 25

COST.

20 steers average weight 1,320 lbs. at 3·664 cents per lb.	$ 967 94
45,413 lbs. prairie hay at $6 per ton	136 23
28,820 lbs. chop at 1 cent per lb.	288 20

3,000 lbs. wheat screnings chop at ½ cent per lb.			$ 15 00
333 lbs. salt			4 16
20 tons straw at $1 per ton			20 00
2,060 bundles green feed at 3 cents per bundle			61 80
	Hrs.	Min.	
Total time cost pumping water	117	45	
Total time cost feeding	91	35	
Total cost			$1,493 33

RECEIPTS.

Sold 20 steers total weight 31,085 lbs., less 5 per cent, at 7 cents per lb.	$2,067 17
Profit on 8 pigs following steers	4 16
Total receipts	$2,072 03
Total cost	1,493 33
Total profit	$ 578 70
Average profit per head	28 93

HORSES.

The horses have been in good condition throughout the year, though the cost of wintering is less than formerly. One heavy team did what work was necessary during the winter and were blanketed and kept in the stable when not at work. The other horses were allowed to run during the day and kept in the stable at night. All were fed straw and two quarts of oat chop each three times daily and have come through the winter in good flesh and heart for the spring work. Estimating the average farm value of oats in Alberta at about 25 cents per bushel, and considering the fact that one bushel of oats makes 56 quarts of chop, a cost of about 90 cents per head per month for chop, is figured out.

The heavy horses have done 3,287 hours of work during the year.

BUILDINGS.

A building for the accommodation of about twenty-five hens was erected. This building is 10 by 18 feet and is provided with a cotton front. The birds wintering in this building were healthy and laid well.

CORRESPONDENCE.

From April 1, 1910, to March 31, 1911, 3,710 letters were received and 3,591 answered.

MEETINGS ATTENDED.

The Station was represented at the Calgary and Edmonton Exhibitions occupying a tent on the grounds and making an exhibit of an educational nature.

I acted as judge of Dairy Cattle and Swine at the Provincial Exhibition at Calgary and as one of the judges and speakers at the Seed Fairs held at Alix, Hardisty, Provost, Daysland, Vermilion, Lloydminster, Innisfree, Vegreville and the Provincial

Seed Fair held this year at Lacombe. I had the pleasure of addressing the convention of the Association of School Trustees for Alberta held at Wetaskiwin, on the subject of 'Agriculture in the Rural Schools.'

I assisted the provincial Department of Agriculture in the short course schools at Macleod, Vermilion and Innisfail and also in the dairy school held at Innisfail.

EXCURSION.

The date of the second annual excursion was July 20, when possibly a thousand people visited the Station, coming by special trains from Calgary and Edmonton, and from the surrounding country in carriages. Addresses were delivered by Hon. Duncan Marshall, Minister of Agriculture for Alberta, Mr. Michener, M.L.A., for Red Deer, Mr. Fream, Secretary of the United Farmers of Alberta, and Mr. W. F. Stevens and Mr. H. A. Craig of the provincial Department. Senator Talbot acted as chairman. The visitors were shown over the Station and the work explained as carefully as possible in such limited time.

ACKNOWLEDGMENT.

Mr. R. E. Everest, who has been foreman here for two years, received the appointment of Superintendent of the Station at Scott, Sask., in March. Mr. S. Edmunds who has been an employee of the Station from the first, is now foreman and is satisfactorily discharging the duties of that post.

DISTRIBUTION OF SAMPLES.

Owing to a change in the policy in regard to the distribution of seed grain, no samples have been sent out from this Station this year. Preparations have been made to distribute samples of potatoes and seedling trees in April, 1911.

METEOROLOGICAL REPORT.

Months.	Highest Temperature.	Date.	Lowest Temperature.	Date.	Total Precipitation.	Total Hours Sunshine.
1910.					In.	
April	81·8	24th	16·7	4th	0·04	212·1
May	81·5	28th	13·8	7th	1·73	281·7
June	89·7	11th	26·7	3rd	3·87	297·0
July	85·1	13th	32·4	25th	1·35	325·2
August	82·8	9th	31·9	22rd, 25th	2·61	249·3
September	80·3	15th	19·5	25th	1·00	193·7
October	77·0	8th	7·0	27th	0·27	165·3
November	43·4	22nd	−2·6	30th	0·51	51·9
December	47·8	19th	−22·1	31st	0·30	71·4
1911.						
January	40·0	3rd	−47·5	13th	0·55	68·6
February	43·6	10th	−39·2	2nd	0·48	152·1
March	61·7	23rd	−3·7	8th	1·01	166·4
Totals	....	....	....	....	13·72	2,234·7

I have the honour to be, sir,

Your obedient servant,

G. H. HUTTON,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOS. A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., March 31, 1911.

To Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to present herewith my report for the year ending March 31, 1911.

The winter of 1910-11 was mild with no very severe storms, heavy snowfalls or drops in temperature, but the cold winds continued till late in the spring, with less than the usual rainfall for that season. The prevailing winds in April, May, and well on into June were north, north-east and north-west, with occasional light frosts during May and June. This was unfavourable for fruit trees blooming during that time, and, in consequence, the crops of apples, plums and pears were very light on the trees here. In this country, a few miles, sometimes, makes considerable difference in climatic condition and this year we suffered from unfavourable weather in spring to a greater degree than places only a short distance away. The cold spring weather did not appear to affect the hay crop, which has been an average one, and the weather during haying was fairly favourable, the crop being saved in good condition. The grain crops were, as a rule, above the average, but showery weather during harvest delayed the work, and the colour of the oats, which is the principal grain crop in this district, was not as bright as usual.

The dry, cool weather in spring prevented the germination of the mangel, carrot and turnip seed and the stand was not an even one, but good growing weather with sufficient rainfall later in the season, filled the roots out and the result has been a fair yield. Owing to the very low prices for potatoes last spring, many lots remaining unsold, fewer were planted and, although the yield has been a fairly good one, the price has been high since the crop was harvested.

Corn as usual, did not make much growth in spring and early summer and was, in consequence, very late and immature when cut.

November and December were wet and cool with no severe drops in temperature. In January, however, the weather turned colder, with a northeast gale and snowstorm; the temperature on the night of the 13th dropped to four degrees below zero, with a gale from the north and snow which drifted into roads and sheltered spots, forming banks in some places ten feet deep. February was cool and the snow did not go off, although the weather was bright.

EXPERIMENTS WITH SPRING WHEAT.

Nine varieties of spring wheat were sown in the test plots, on April 22, at the rate of one and one-half bushels per acre. The land on which these plots were sown had given a crop of roots in 1909; these in turn had been grown on a clover sod,

which had been manured and was in fairly good condition. The stand of wheat was uniform and the grain plump, bright and clean, but, owing to the dry weather, the heads did not fill out to the tip and the yields were only fair. The seed was treated with formaldehyde and there was no smut or rust on any of the plots.

SPRING WHEAT—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Strength of Straw on a scale of 10 points.	Average Length of head	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bu.	Lbs.	Lbs.
1	Stanley	Aug. 12.	113	48	10	3½	Beardless.	5,120	30	40	63·4
2	Bishop	" 17.	118	43	10	3½	"	5,140	28	20	63·3
3	Pringle's Champlain	" 16.	117	50	10	3 to 4	Bearded.	5,200	28	..	63·6
4	Huron	" 15.	116	45	10	3 to 3½	Beardless.	5,520	27	20	63·1
5	Red Fife	" 13.	114	45	10	3 to 3½	"	4,880	27	.	63·3
6	Chelsea	" 15.	116	45	10	4	"	4,400	24	40	64·7
7	Preston	" 9.	110	44	10	4	Bearded.	4,720	23	..	63·8
8	White Fife	" 13.	114	42	10	3½ to 4	Beardless.	4,720	22	40	62·0
9	Marquis	" 11.	112	42	10	3½ to 4	"	5,350	21	..	63·4

EXPERIMENTS WITH OATS.

Nineteen varieties of oats were sown in the test plots. The previous crop was roots and the land was in very good condition as to fertility and was well prepared, having been ploughed early in the spring and harrowed several times before the seed was sown.

The seed was carefully treated with formaldehyde and was sown April 22, at the rate of two and one-half bushels per acre. The stand was even, the heads were long and the grain was plump. There was no smut in the heads, but some varieties were rather badly rusted. The straw was stiff and stood up well until harvested. The yield was a fairly good one.

OATS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing	Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning	Rusted.
				Inches.		Inches.		Lbs.	Bu.	Lbs.	Lbs.	
1	Pioneer.....	Aug. 11.	112	38	10	9	Branch'g	4,840	81	6	39·0	A little.
2	Improved American.	" 13.	113	44	10	10	"	5,200	80	20	36·1	"
3	Golden Beauty...	" 12.	111	38	10	10	"	5,200	80	..	35·9	"
4	White Giant	" 9.	108	38	10	8	"	5,260	77	22	36·0	"
5	Improved Ligowo...	" 8.	107	44	10	10	"	4,800	76	26	40·1	Considerably.
6	Twentieth Century. .	" 12.	111	41	10	9	"	4,720	76	16	37·7	Very little.
7	'Reg.' Abundance....	" 9.	108	42	10	9	"	5,360	75	30	40·2	"
8	Lincoln.....	" 10	109	40	10	9	"	5,180	75	20	37·0	Considerably.
9	Banner.....	" 10.	109	42	10	10	"	4,800	74	24	37·0	
10	Abundance..	" 9.	108	42	10	9	"	5,100	72	12	37·8	Slightly.
11	Wide Awake	" 11.	110	42	10	9	"	5,280	72	12	37·0	"
12	Tartar King	" 9.	108	40	10	9	Sided....	5,040	71	6	38·1	"
13	Irish Victor.	" 10.	109	40	10	10	Branch'g	4,480	70	12	37·8	Considerably.
14	Swedish Select	" 8.	107	42	10	9	"	4,840	70	..	38·0	"
15	Siberian....	" 10.	109	40	10	9	"	4,720	68	28	36·0	Very little.
16	Virginia White....	" 9.	108	40	10	9	"	5,080	63	18	39·0	Considerably.
17	Danish Island . ..	" 14.	114	40	10	9	"	4,480	61	26	37·5	None.
18	Gold Rain..	" 9.	108	42	10	10	"	4,720	60	..	41·0	Considerably.
19	Thousand Dollar....	" 12.	111	46	10	11	"	5,120	54	24	40·0	"

EXPERIMENTS WITH BARLEY.

Twenty-one varieties of barley were sown in plots of one-fortieth of an acre each. The previous crop was roots, and, late in the fall, the land was ploughed and harrowed. In March it was ploughed to break up the surface and start the weed seeds. It was harrowed every few days until April 21, when the seed was sown. The seed was treated with formaldehyde and the plot sown at the rate of two and one-half bushels per acre. There was no smut in the grain or rust on the straw, which was bright and fairly stiff.

Eleven varieties of six-row, and ten varieties of two-row were tested in this series.

Six-Row Barley—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Mensury	Aug. 3	104	43	10	4	5,440	45	20	48·1
2	Trooper	" 9	110	39	10	3½	6,040	45	4	50·2
3	Odessa	" 2	103	42	10	3	4,800	45	..	51·0
4	Oderbruch	" 5	106	43	10	3½	4,720	43	36	52·3
5	O.A.C. No. 21	" 5	106	40	6	3½	5,160	41	12	50·0
6	Mansfield	" 6	107	44	6	4½	4,640	39	8	49 8
7	Yale	" 8	109	43	8	3½	4,580	39	8	50·0
8	Albert	" 4	105	41	10	3½	4,600	35	..	51·5
9	Nugent	" 8	109	39	10	3½	4,960	34	28	50·0
10	Stella	" 7	108	38	8	3½	4,840	32	44	50·5
11	Claude	" 4	105	41	8	4	5,040	31	12	51·5

Two-Row Barley—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw including Head.	Strength of Straw on a scale of 10 points.	Average Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Danish Chevalier	Aug. 10	112	40	10	4 to 5	4,960	52	44	53·0
2	Standwell	" 12	114	40	10	3	5,960	47	24	53·5
3	French Chevalier	" 9	111	38	10	4	5,880	44	8	53·3
4	Clifford	" 8	110	46	10	4 to 5	5,240	43	36	53·6
5	Invincible	" 12	114	42	10	3½	5,110	43	16	54·0
6	Swedish Chevalier	" 10	112	44	10	4 to 5	5,640	42	24	53 3
7	Beaver	" 8	110	40	10	4 to 4½	5,040	40	20	54·8
8	Canadian Thorpe	" 12	114	40	10	3 to 4	5,440	40	..	52·7
9	Jarvis	" 10	112	48	10	5 to 6	5,040	37	44	51·3
10	Hannchen	" 6	108	40	9	4 to 4½	5,460	37	24	54·1

EXPERIMENTS WITH PEAS.

Thirteen varieties of field peas were sown in the regular test plots of one-fortieth acre each. They were all sown April 21, on a clover sod which had been ploughed the previous fall and was well prepared by repeated harrowings.

The large varieties were sown at the rate of three bushels per acre and the small at the rate of two and one-half bushels per acre. The stand was uniform and the growth vigorous and promising, but the dry summer, and a few very hot days when they were in bloom, brought on a quite severe attack of mildew, which reduced the yield.

PEAS—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Weight of Straw.	Average Length of Pod.	Size of Pea.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.	Lbs.	Inches.		Bush.	Lbs.	Lbs.
1	Chancellor....	Aug. 12.	113	50	5,680	2½	Small..	40	40	65·0
2	Picton..............	" 15.	116	56	5,560	3	Medium	36	20	62·1
3	Gregory........	" 17.	118	53	4,840	3	"	34	..	64·6
4	Black-eye Marrowfat	" 19.	120	62	5,420	3½	Large..	33	20	63·0
5	Prince..	" 17.	118	46	4,920	3½	" ..	33	10	65·0
6	White Marrowfat...	" 17.	118	56	4,720	3	" ..	33	..	63·0
7	Golden Vine........	" 16.	117	52	5,120	2½	Small..	32	40	64·0
8	Prussian Blue.......	" 14.	115	49	5,160	2½	" ..	32	20	64 0
9	Mackay	" 16.	117	50	5,400	3½	Medium	32	..	63·5
10	English Grey........	" 16.	117	56	5,360	3	"	30	40	62·0
11	Paragon..	" 15.	116	50	5,120	3	Large..	30	..	65·2
12	Daniel O'Rourke....	" 13.	114	51	5,440	2½	Small..	28	40	64·5
13	Arthur..	" 14.	115	50	5,320	3	Large..	28	..	64·0

EXPERIMENTS WITH INDIAN CORN.

Eight varieties of Indian corn, grown for ensilage, were planted on May 19, on a clover sod which was ploughed early in April and harrowed repeatedly with disc and spading harrows to cut the sods and start the weed seeds. A dressing with the spike tooth drag left the land in fine condition for the seed. For convenience in cultivation, the corn was planted in hills, three feet apart each way. To protect the sprouting seed from crows, which are very plentiful, the seed received a coating of coal tar before planting, and the stand was very uniform.

The weather in spring was cold with showers and until the first week in July the growth was poor. The season as a whole was a very unfavourable one for corn and, although the gross yield was a fairly heavy one, the corn was very green and immature and very few stalks had ears advanced in growth to the roasting ear stage.

The plots were harvested October 7 and 8, and put into the silo at once.

The yield per acre was estimated from the product of two rows, each sixty-six feet long.

INDIAN CORN—Test of Varieties.

Number.	Name of Variety.	Height.	In Silk.	Condition when Cut.	Weight per Acre Grown in Hills.	
		Inches.			Tons.	Lbs.
1	Superior Fodder........................	120	Oct. 7 ...	Ears forming...	22	660
2	Longfellow	112	Sept. 16....	Late milk.	21	1,560
3	Wood's Northern Dent.....................	112	Oct. 1....	Ears forming ..	19	1,710
4	Compton's Early	112	Sept. 16....	Late milk......	19	1,050
5	Angel of Midnight....	106	" 16....	"	18	1,950
6	Early Mastodon........	116	Oct. 1....	Ears forming...	16	1,880
7	Eureka...........	107	" 7....	In silk..	16	1,820
8	Selected Leaming........	106	Sept. 24....	Early milk......	16	560

EXPERIMENTS WITH TURNIPS.

Ten varieties of turnips were sown in drills two feet apart. Two sowings of each variety were made, the first on May 4, and the second on May 18. Four drills of one hundred feet in length were sown of each variety and the yield in each case was computed from the yield of sixty-six feet of the two centre rows in each plot.

The first part of the season was dry and unfavourable, but rains in August started the growth, which, during the last few weeks, was rapid. The yield was a fairly good one and the quality very good. The soil was a light sandy loam, but a heavy growth of clover had been turned under in July of the previous year and a dressing of about ten loads of barn-yard manure per acre was spread and worked into the soil with the disc and drag harrows. Early in the spring, the land was disced and worked over with the spike-toothed drag and was in fine tilth when the seed was sown, and the plots were very free from weeds. The plants were thinned to about eight or nine inches apart in the drills. The roots were pulled on October 22.

TURNIPS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Jumbo	38	735	1,278	45	32	1,176	1,086	15
2	Halewood's Bronze Top	31	1,030	1,050	30	30	290	1,004	50
3	Perfection Swede	26	1,965	899	25	25	655	844	15
4	Hall's Westbury	25	820	847	..	29	80	968	..
5	Good Luck	25	490	841	30	23	365	772	45
6	Mammoth Clyde	24	15	800	15	28	593	943	15
7	Magnum Bonum	23	1,520	792	..	23	1,190	786	30
8	Hartley's Bronze	22	1,870	764	30	19	610	643	30
9	Carter's Elephant	21	900	715	..	25	1,480	858	..
10	Bangholm Selected	20	1,745	695	45	19	1,270	654	30

EXPERIMENTS WITH MANGELS.

Eight varieties of mangels were sown in the comparative test plots this season. The soil was a sandy loam, underlaid with gravel, and suffers if the season is very dry. It was in clover the previous year and one crop was taken off it in June. After the hay was removed, the land was given a light dressing of stable manure, about ten loads per acre, which was scattered thinly and then harrowed with the spike-toothed drag. In July, a fine growth of clover was turned under and immediately rolled and harrowed.

Early this season, the land was gone over repeatedly with the disc and spike-toothed drag and was in fine tilth when the first sowing was made on May 4. Another set of plots were sown on May 18. The ground was rather dry and the seed was very slow in germinating and the stand uneven.

Four drills, each one hundred feet long, of each variety, were sown at both sowings with the drills two feet apart, and, where necessary, the plants were thinned to about eight inches in the drill. The yield per acre was computed from the product of sixty-six feet of the two centre drills in each plot.

The mangels were all pulled on October 21.

MANGELS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Perfection Mammoth Long Red	28	1,420	957	..	26	965	882	45
2	Yellow Intermediate	27	1,110	918	30	24	1,665	827	45
3	Half-Sugar White	21	900	715	..	18	135	602	15
4	Giant Yellow Globe	20	920	682	..	16	1,990	566	30
5	Gate Post	19	1,930	665	30	20	1,085	684	45
6	Prize Mammoth Long Red	19	1,600	660	..	19	115	635	15
7	Selected Yellow Globe	19	1,435	657	15	17	1,970	599	30
8	Giant Yellow Intermediate	19	1,270	654	30	17	980	583	..

EXPERIMENTS WITH CARROTS.

Five varieties of carrots were sown on a sandy loam which had had a clover stubble turned under in the summer of 1909, and about twelve wagon-loads of barn-yard manure per acre scattered and worked into the soil in the autumn. It was then repeatedly harrowed to destroy the weed seeds. The land was disced and harrowed early in the spring of 1910, and was in good condition when the seed was sown, but the weather just then was dry with a north wind, the surface of the field became dry and the seed was slow in germinating; one variety did not germinate at all and in no case was the stand at all uniform.

Two sowings were made, the first on May 4 and the second on May 18, in drills two feet apart, and the plants were thinned to four or five inches apart in the row, where necessary. The carrots were all pulled on October 21 and the yield was calculated from the product of two rows, each sixty-six feet long.

CARROTS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	31	40	1,034	..	25	1,315	855	15
2	Ontario Champion	30	1,050	1,017	30	25	1,480	868	..
3	White Belgian	28	430	940	30	30	720	1,012	..
4	Mammoth White Intermediate	26	470	872	50	24	875	814	30

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were sown in drills two feet apart. Two sowings were made of each variety, the first on May 4, and the second on May 18. The soil was a warm loam which had been manured the previous year and fall-ploughed. It was cultivated with the disc and spike-toothed drag in March and at intervals until the seed was sown.

Owing to unfavourable weather in the spring, the seed did not germinate evenly, the stand was uneven, and the yield was light. Four rows of each variety were sown

at each sowing and the yield was computed from the returns from the two centre rows each sixty-six feet long.

The beets were pulled on October 21.

Specimens were sent to the Dominion Chemist, Mr. Frank T. Shutt, for analysis of sugar-content. The results are included in the following table:—

SUGAR BEETS—Test of Varieties.

Number.	Name of Variety.	Yield per Acre.								Sugar in Juice.	Solids in Juice.	Co-efficient of Purity.
		1st Plot.		1st Plot.		2nd Plot.		2nd Plot.				
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	%	%	
1	Vilmorin's Improved....	17	1,200	586	40	16	1,660	561	..	19·92	21·37	93·2
2	Klein Wanzleben.......	14	1,960	499	20	12	1,080	418	..	20·08	22·03	91·1
3	French Very Rich.	13	620	443	40	12	640	410	40	17·55	19·11	91·8

EXPERIMENTS WITH POTATOES.

Seventeen varieties of potatoes were planted in the trial plots this season.

The soil was a fairly light, sandy loam and suffered from the drought of summer, which reduced the yield considerably. There was no disease, either in the tops or tubers and the latter were remarkably even in size, clean, smooth and of very good quality. They were planted from May 6 to May 11, in rows thirty inches apart, one foot apart in the drill, the seed being cut to two strong eyes to the set. Hard-to-Beat and Factor are new varieties, the seed did not germinate well and the stand was very uneven. The tubers of these two varieties are smooth and even in size and of the popular white colour. The potatoes were dug on September 24 and 26, and the yield was estimated from the product of two rows, each sixty-six feet long.

POTATOES—Test of Varieties.

Number.	Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Morgan Seedling........................	400	24	360	..	40	24	Long, pink.
2	Dalmeny Beauty........................	369	36	332	24	37	12	Oblong, white.
3	Empire State..........................	334	24	301	24	33	..	"
4	Dreer's Standard......	321	12	276	..	45	12	"
5	American Wonder......................	310	12	265	12	45	..	Long, white.
6	Money Maker................	302	36	273	..	30	36	Oblong, white.
7	Carman No. 1......	288	12	245	..	43	12	Round, white.
8	Irish Cobbler....................... ..	283	48	243	24	40	24	"
9	Gold Coin...........	277	12	249	12	28	..	Long, white.
10	Reeves' Rose...................... .. .	259	36	234	..	25	36	Long, rose.
11	Everett...............................	251	44	214	..	37	44	"
12	Rochester Rose...........	250	48	225	48	25	:	"
13	Late Puritan..........................	246	24	209	..	37	24	Long, white.
14	Ashleaf Kidney	246	12	222	..	24	12	Oblong, white.
15	Vick's Extra Early.....................	215	36	172	36	43	..	Oblong, pink.
16	Hard-to-Beat..........................	118	48	103	..	15	48	Long, white.
17	Factor................................	94	36	79	36	15	..	"

SUMMARY OF CROPS, 1910.

	Tons.	Lbs.
Hay—		
Mixed Clover, Italian Rye grass and Orchard grass..	107	1,650
Ensilage—		
Corn and Clover........................	80	....
	187	1,650

	Tons.	Lbs.
Roots—		
Mangels..	7	1,300
Turnips..	53	650
Carrots..	4	1,200
	65	1,150

	Bushels.
Grain—	
Oats..	512
Spring wheat..	80
Barley..	18
Peas..	200
Peas, oats and barley, mixed	1,450
	2,260

No fall wheat or rye was grown here in 1910.

GARDEN VEGETABLES.

The cold, drying winds and lack of rain throughout the spring kept the surface of the ground so dry that small seeds failed to germinate or grew very feebly, and the garden vegetables were a comparative failure.

Table Beets—Sown May 3.

Extra Early Egyptian Blood Turnip.—A very poor stand. Only a very few seeds germinated and they grew very slowly. Fit for the table August 10, but not of high quality.

Early Blood Turnip.—Sown May 3. A poor stand. Fit for the table August 15; of fair quality.

Long Blood.—Sweet and pleasant; of very good quality. A good keeper for winter use.

Table Turnips—Sown May 3.

Extra Early White Milan.—The seed germinated well and the turnips were fit for the table on June 13. Very sweet and pleasant in flavour.

Early Snowball.—An even stand. Turnips, small but crisp, sweet and very good.

Early Stone.—Not first-class in any respect as the flesh was tough, stringy and strong. Large enough for table use July 18.

Golden Ball.—A strong grower, forming a solid, smooth turnip, but not equal in table qualities to the earlier sorts.

RADISH—Sown April 20.

Early Scarlet Turnip.—A quick growing variety; sweet, crisp and pleasant. Fit for table May 24.

Early Scarlet Tipped.—Fit for the table May 26. A smooth, crisp, sweet sort and a rapid grower.

Long Black Spanish.—Sown August 2. A strong grower but not crisp or sweet; stringy, tough and pungent.

LETTUCE—Sown in Hotbed April 1.

Iceberg.—A rapid grower. Heads, solid, crisp and very good. Fit for the table May 24 and continues crisp for a long time. Sown in the open May 2.

Simpson's Early Curled.—A rapid grower and a crisp, sweet, fine-flavoured sort. Fit for the table June 4.

Early Prize Head.—Fit for the table June 8; sweet and crisp, heads solid, and a very heavy cropper.

GARDEN PEAS—Sown April 30.

The peas were sown in drills thirty inches apart.

Rennie's Queen.—Vines, twenty to twenty-four inches long; moderately productive. Pods, three to four inches long, containing from four to seven large peas of very fine flavour and quality. Fit for the table June 20.

Thomas Laxton.—Vines from twenty-four to thirty inches long and moderately productive. Pods of medium length and containing from four to six medium large peas of very fine quality. Fit for the table July 3.

The Pilot.—Vines, twenty-four to thirty-six inches long, and productive. Pods, long and well filled with large peas of very superior quality. Fit for the table July 4.

Sutton's Earliest Marrow.—Vines, fifteen to twenty inches long and of more than average productiveness. Pods of medium length and containing from three to five medium sized peas, of good flavour. Season very short, as the vines were ripe August 1. Fit for the table July 10.

Improved Ringleader.—Vines twenty-four to thirty inches long and very productive. Pods, well filled but quite short, containing from three to five medium-sized peas, of very good quality. Fit for the table July 14 and ripe August 5.

Star of Australia.—Vines of medium length and very productive. Pods, long, containing from five to nine large, sweet peas, of very fine quality. The vines continue producing peas for the table during the whole month of August. First fit for the table July 16.

New Dwarf Telephone.—Vines fifteen to twenty inches long and very productive. Pods, long and well filled with large very sweet peas, of delicious quality. Fit for table July 18, and the season continues well on into August.

Hedges, Agassiz, 1908. Retinospora Squarrosa in centre.

Gradus.—Vines thirty to thirty-six inches long and moderately productive. Pods, long and well filled with peas of large size and of the best quality. Fit for table July 20, and continues in season for several weeks.

BEANS—Planted May 2.

Dwarf Edible Podded.—Vines dwarf and very productive. Pods three and one-half to five inches long, crisp, pleasant and sweet. Fit for table July 2. Very short in season.

Emperor of Russia.—Vines dwarf and not productive. Pods two and one-half to four inches long. Of very mild, pleasant flavour. Fit for table July 6.

Dwarf Wax Every Day.—Vines vigorous and very productive. Pods four to five inches long, curved, plump and crisp, fine-grained and of mild, pleasant flavour. Fit for table July 7, and continues producing pods for several weeks.

Dwarf Matchless.—Vines short, stocky and very productive. Pods three to five inches long, plump, crisp and of fine quality. Fit for table July 10.

Fame of Vitry.—Vines vigorous and tall enough to carry the bean pods clear of the ground. Very productive. Pods four to six inches long, plump, crisp, and of excellent flavour.. Fit for table July 10, and continues producing fresh pods for a long time.

Michigan White Wax.—Vines dwarf, but very productive. Pods short but plump, crisp, with a sweet delicate flavour. A very fine table bean. Fit for table in July, and continues in season for a long time.

PARSNIP.

These were sown in drills two feet apart on May 3. The seed came forward very slowly but the stand was fairly even and a fair crop of long, plump roots of very fine flavour and quality was obtained.

Sutton's Student.—Plants coming up May 13. A fair stand. The roots were short, thick and very irregular, but sweet and of good flavour.

CABBAGE.

Sown in beds in the garden in April and transplanted May 14. The seed did not germinate freely, although the soil was kept moist and the plants did not make a satisfactory growth until transplanted.

First and Best.—Eighteen plants were set out on May 14, and one plant was cut off and replanted. Of the seventeen plants left of the first planting, sixteen made firm solid heads. The first head was cut on July 3, and was solid, crisp and white and very tender.

Early Jersey Wakefield.—First head cut on July 11; crisp, solid, very white, sweet and finely flavoured. Out of eighteen plants set, fifteen made solid, merchantable heads.

Glory of Enkhuizen.—A very regular header, and heads fairly large, solid and of fine flavour. Fit for the table August 9. Eighteen stocky plants were set out and seventeen made medium large, solid heads.

Early Winningstadt.—Eighteen plants were set out on May 14, and fourteen made heads; twelve of these were very fine, handsome and solid; two were smaller. Fit for the table latter part of August.

Danish Ball Head.—Heads of medium size, very hard, solid, white and crisp, of good quality. Eighteen plants were set out on May 14; fifteen very fine heads formed. An excellent winter cabbage.

Fottler's Drumhead.—A strong grower and an even, regular header. Eighteen plants made sixteen fine heads. A very good late fall and winter cabbage.

Red Zenith.—An even, regular header. Heads medium small but solid, crisp and of fine quality. Eighteen plants set out on May 14 made fourteen fine, solid heads, of a very dark-red colour.

Savoy Drumhead.—A regular header; heads large, flat, solid, and crisp; of very fine flavour and a good keeper. Eighteen plants made eleven solid heads of good size and four second-class heads.

Perfection Savoy.—A very regular header; heads very solid, crisp, of delicate and delicious flavour. An excellent keeper. Eighteen plants made fifteen very good heads.

CARROTS.

These were sown in drills eighteen inches apart on May 3. The seed did not germinate well and the stand was uneven.

Early Scarlet Horn.—Stump-rooted and a very rapid grower. Very sweet, crisp and pleasant in flavour. Fit for table June 30.

Chantenay.—A very poor stand, but the plants made rapid growth when the rains came . A very solid, sweet carrot, usually a heavy cropper and easily harvested.

Amsterdam Scarlet.—A medium stand. Carrots crisp, sweet, with a mild, pleasant flavour; a good keeper.

CAULIFLOWER.

These seeds were sown in open beds in April. The seed did not germinate freely, and the plants grew slowly until after they were transplanted.

Earliest Erfurt.—Transplanted on May 14 and, as the ground was rather dry, the plants were carefully watered until they were thoroughly established. Eighteen plants were set out and thirteen developed fine heads; five plants were destroyed by cutworms or failed to make good heads. First fit for table in the middle of July.

Lenormand Short Stem.—Eighteen plants were set out on May 14, and the first head was fit for the table on August 18. The heads were large, solid and of very fine quality. Fourteen plants made good heads.

Autumn Giant.—Only ten plants were set out and seven developed large, solid heads. Fit for the table by the middle of September. Heads, solid, large, crisp and sweet.

BRUSSELS SPROUTS.

These were sown at the same time as the cauliflower and were transplanted May 17. The seed did not germinate well and only ten plants of each variety were set out.

Improved Half Dwarf.—The growth was stocky and well set with solid sprouts of fine flavour. Fit for the table all winter.

Giant.—A tall, stocky grower, with the stalk well set with large, firm, crisp sprouts. Of very fine flavour and an excellent keeper.

BROCOLI.

Sown in beds in the open garden in April and transplanted May 17.

Extra Early White.—A reliable header and a rapid grower.. Fit for the table early in August. There were ten fine, crisp heads from twelve plants set out.

Walcheren.—Fit for the table in August. From nine plants set out on May 18, fine heads were produced, large, crisp and solid; of very good quality.

CELERY.

Three varieties of celery were sown in beds in the garden, at the same date as the cabbage. The seed did not germinate and no plants of this vegetable were grown.

SPINACH.

Two varieties of this vegetable were sown in drills eighteen inches apart, on May 17.

Curled-Leaved Savoy.—Leaves thick and crisp. A very rapid grower and of fine, delicate flavour.

Short Season.—A rapid grower and does not run to seed for a long time after being fit for table.

ONIONS.

These were sown in drills eighteen inches apart on May 3. The seed germinated very slowly and did not grow much until copious rains came, too late in the season for them to make good bottoms and ripen.

Danver's Yellow Globe.—An uneven stand. Only a very small percentage made any bottom; a nice, mild onion, when well grown.

Large Red Wethersfield.—An uneven stand, but about one-third of the plants developed medium-sized bottoms, which ripened fairly well. This in one of the best croppers we have tested.

Australian Brown.—Very few seeds germinated and the plants did not make a vigorous growth. There were a few nice onions, of very good quality. A good keeping sort when well ripened and cured in dry weather.

Paris Silverskin.—This variety germinated the best of any. The crop was good and the bulbs ripened up early. A fine onion for pickling.

TABLE CORN.

The following varieties were planted in hills three feet apart each way, on May 7.

Golden Bantam.—Tasseling out on July 24, and in silk August 4. Fit for the table August 14. The cold season was unfavourable to the rapid growth of corn and this variety took eleven days longer to grow to table condition than it did last year. The stalks were 36 to 48 inches long, with frequently three ears to a stalk. The ears were four to six inches long and well filled out with very sweet pleasant-flavoured corn.

Malakoff.—Planted May 7. Stalks stout and from 48 to 60 inches high. Ears, six to eight inches long and thick; well filled with deep, white grains; not so sweet or good as Golden Bantam. Fit for table August 26.

Pocahontas.—Stalks, five to seven feet high, slender, productive. Ears, six to eight inches long, well filled out to the tip with sweet, well-flavoured corn. Fit for the table August 26, and remains tender and good for a long time.

SQUASH.

Six varieties of squash were planted on May 12. The bush varieties were planted in hills six feet apart each way and the running varieties in hills nine feet apart each way.

Golden Custard.—A very strong, bushy grower and productive. Squash, four to eight inches in diameter. Fit for the table July 28.

Long White Bush Marrow.—A strong grower and very productive Squash, from ten to twelve inches long and four to six inches in diameter; quality, very fine for table use. Fit for use August 2.

Essex Hybrid.—A strong, running variety and productive. Squash, weight from eight to twelve pounds, very thick fleshed; very sweet, pleasant-flavoured. A very good fall and winter variety.

Hubbard.—A strong grower and very productive. Flesh, thick and solid, sweet, fine-grained, and very good for table use; a good keeper.

Fordhook.—A good grower and productive. Flesh, thick, fine-grained and very sweet. A good winter squash.

Mammoth Whale.—A very strong grower. Squash, very large, rather coarse in texture, and not a table variety.

CLEARING.

About two acres of land have been cleared and all small trees and scrub grubbed out and burned off and the land is now ready for the plough.

No ditching has been done this year.

CATTLE.

The herd of Shorthorns numbers twenty cows and heifers, one stud bull and four young bulls. Dairying is so profitable in the western portion of the mainland and on Vancouver Island, that the dairy breeds have supplanted the beef breeds, and the demand for Shorthorn bulls is steadily falling off. It is a question whether it would be better to sell the herd here and replace them with a dairy herd. All of our stock are in good condition and in excellent health.

SHEEP.

The cougars have killed a number of our lambs each year for two or three years, and some other flocks in the municipality have suffered more severely than that on the Farm. As there is so much cover for wild animals on these wooded mountains, it is difficult to make sheep breeding profitable. Our flocks consists of twenty-two females and two buck lambs.

PIGS.

The stock of pigs at present on the Farm consists of twenty-seven White Yorkshires of all ages and ten Berkshires. Our breeding stock of both breeds are very superior animals, and those sold have given satisfaction in every case to the purchaser. As the price for pork products is high, the demand for breeding stock has been good.

HORSES.

The horse stock is the same as in my last year's report, none having died, nor any having been bought. There are three teams of work horses, one of the original stock brought here in 1889, which is a useful beast yet, and a general purpose mare.

BEES.

The cool, dry spring and summer was not very favourable for honey gathering, but all old or early swarms went into winter with sufficient stores, and, at this writing, there are fifteen strong swarms.

FOWLS.

We have had the same breeds of fowls in 1910 as in the three previous years, namely, Black Minorcas, Barred Plymouth Rocks, White Wyandottes, Rhode Island Reds and Buff Orpingtons. As conditions were not materially changed, either as to climate or care, the results this year were similar to those of previous years. A good strain of any of these breeds are good layers and all, except the Black Minorcas, are good table fowls if well fed and cared for.

The fowls are kept confined, each breed in a separate pen, with a yard attached, from January 1 to July 1. During the balance of the year they are at large. While they are confined in their pens, the fowls of one pen, each in their turn, are at large. This gives them their liberty one day in five, when they have the range of the Farm and eat grass and insects of various kinds. This is likely to ensure a better hatch and stronger chickens.

The hens are fed mixed grains, about half wheat, one-quarter oats and one-quarter barley or peas. In winter, they have a cabbage head or turnip to pick, also small potatoes boiled and mashed with any chop there may be on hand; they also get any milk there is to spare. They have grit, broken clam shells and water always before them.

Their pens are cleaned once a week, when fresh chaff or straw three or four inches deep is put on the floor. The whole of the inside of the building is cleaned several times a year with whitewash, to which is added carbolic acid. The roosts are frequently washed with sheep dip. The hen house and fowls are almost free from insects of any kind. It is necessary to keep a hen house very clean in this climate, as we have considerable mild, damp weather. We find dampness much more trying to fowls than bright, frosty weather.

There is a good demand for eggs for setting and for any birds, either male or female, which there are to spare.

NUT PLANTATION.

The nut trees and bushes are receiving a good deal of attention throughout the province and many letters of inquiry are received and replied to.

Filbert.—Our plantation of these nuts, embracing over forty named varieties got from nurseries in England, France and Germany, continues to make a strong, healthy

growth, but does not fruit well, except one variety, known as Pearson's Early Red. This variety fruits freely and regularly and is one of the earliest to ripen. The nut is small, with a thin shell and a plump kernel of very fine flavour and, under more favouring conditions, would prove profitable, as there is a good demand and good prices for filberts. Here, however, the large areas of land clothed with timber make a good breeding ground for blue jays, and these come by dozens and strip the bushes of the crop before it is ripe.

Shellbark Hickory.—The hickory trees are making a fine annual growth and fruit freely, but, as our trees are seedlings, unfortunately, the fruit is too small to be of value. The hickory seedlings vary so much that it is too much of a lottery to plant any but grafted trees of the best varieties. The soil and climate appear to suit the hickory, and it is more than probable that a plantation of selected varieties would, in time, prove profitable.

Pecan.—This variety of the hickory does not make a strong growth and is evidently unsuited to this climate.

Butternut.—The trees grow vigorously and make fine shade trees, but do not fruit freely and are not of value as nut-bearing trees in this part of the province. As the tree is very hardy, it may be of value in parts of British Columbia where tenderer trees would not thrive.

Black Walnut.—This variety of walnut makes a strong, healthy growth and develops into a handsome tree. If planted on hillsides, where cultivation is impossible, it will grow into valuable timber trees. A few planted here in the spring of 1890, have grown to over thirty feet high, are from ten to fourteen inches in diameter at one foot above the surface of the soil, and are producing a small crop of nuts each year.

Chestnut.—The chestnut trees have, for some years, made a strong growth and have developed into handsome trees, but the last two seasons have been rather severe on them, apparently, as two of them have died and several of the others in the nut orchard are dying. They have not been very productive, the trees blooming so very late that the fruit does not develop before the cool weather in October sets in, and we seldom have any perfect nuts.

English Walnut.—The trees of this variety planted in the spring of 1893, have grown well and are now twenty to twenty-five feet high, with a great spread of top and a diameter of ten to twelve inches of trunk at one foot above the surface of the ground. They produce a small crop of nuts each year and, as the trees grow older, may become profitable, as the nuts are large, thin-shelled and of fine flavour.

Japanese Walnut.—(Variety 'Sieboldi'). This is one of the handsomest shade trees in the collection here. The trees are vigorous growers with very luxuriant foliage and are early bearers and very productive. The trees, two years old when planted in the nut orchard at forty feet apart, have grown so that the branches touch and the crop of nuts grown in 1910 was the thirteenth crop in succession. These nuts have been distributed to planters in many parts of British Columbia and, from reports received, they have done very well in many places.

FOREST PLANTATION.

The land for this plantation was cleared and ploughed in 1892, and the trees planted in the spring of 1893, at which time the greater portion of them were two-year old seedlings and consisted mainly of different varieties of oak, elm, ash, maple, chestnut, walnut, white pine, Austrian pine, Scotch pine, beech and larch, with a few trees of rarer sorts.

Almost without exception, the trees have grown well and many of them, such as the larch, elm, and basswood, are over thirty feet high and a foot in diameter a foot from the surface of the ground. They were planted in rows ten feet apart each way. The first year, the land was cultivated and, in the spring of the second year, seeded with red clover, which has been gradually killed out in the shade of the trees until the latter occupy the ground almost entirely, there being only some scattered tufts of native grasses. The white pine appears to be admirably suited to this soil and climate and some of the trees of that timber will, in a few years, be almost large enough to cut for lumber.

In the spring of 1892, 1893 and 1894, a large number of small seedling timber trees were planted in the open spaces on the steep sides of the mountain, from near the base up to an elevation of over one thousand feet. These trees have received no care or attention since they were planted but a great many of them have made a fair growth. Owing to the dense growth of ferns and scrub, the growth of the trees has been slender, and clean of limbs below. They promise to make fine timber trees in time, if the mountain can be protected from fire. A quantity of black walnuts, butternuts, hickory nuts and chestnuts were planted on the mountain and a fair percentage of these grew and are making fair progress. As the initial expense was very small, the land of no value for other purposes, and no further expense was incurred, the timber will, at a future time, be valuable at little cost.

ORNAMENTAL AND FLOWERING TREES AND SHRUBS.

Nearly all of the ornamental trees and shrubs planted have grown well but, of course, some are much more desirable than others. In flowering trees, the Magnolias have grown well and bloom early in spring, as does the pink, scarlet and white Hawthorn, the pink and white flowering Dogwood and the Laburnum. All of the above are growing vigorously and flower freely. In shrubs, the Rhododendrons, Azaleas and Kalmias make a magnificent display early in May, followed by the Lilac, of which we have a very good collection.

All of these shrubs and trees are hardy enough to endure our severest winters and bloom regularly and profusely. Following these, the Weigelias, Deutzias, Wistaria and Snowball furnish bloom until the roses come, almost all of the hardier varieties of which grow and bloom luxuriantly. For later bloom, the Japanese Hydrangeas commence to flower early in July and continue until the frost cuts them off in November. The Chinese Wistaria blooms freely a second time as a rule, commencing late in July and continuing through August. The *Hydrangea grandiflora* makes a magnificent display of bloom in August and September, and the *Clethra alnifolia* makes a fine show of sweet-scented spikes of white flowers from early in August until November. There are a number of flowering shrubs in our collection which are very ornamental, but those mentioned are perhaps the most striking and valuable.

The following trees grow vigorously in this climate and, where they have room to develop properly, make very handsome shade trees, either for lawn or street planting:—white oak, scarlet oak, mossy-cup oak, pin oak, English oak, chestnut oak and red oak; Amercan elm, American, copper and fern-leaved, beech; American and European linden and white basswood; Scarlet, sugar, European cork, sycamore, Norway, Reitenbach's purple, and Schwedler's, maple; the tulip trees and the Eastern white pine. Of all of the above, we have very handsome specimens, some of the oaks being over twenty-five feet high, with splendid heads.

APPLES.

The cold winds and light frosts in the blossoming time of the tree fruits was very unfavourable; the fruit crop was small and not up to the standard in quality. Orchard No. 3, which is the only one of the old apple orchards left, was, owing to the excessive rainfall in November of 1909, aided by the run-off from the mountain, under water for several weeks in the winter of 1909-10, and this left the trees in an unhealthy condition. The fruit crop there has been light and of poor quality.

COMMERCIAL APPLE ORCHARD.

The following varieties have been added to this orchard; twelve trees of each variety having been planted in April and all having made a satisfactory growth: Belle de Boskoop, Delicious, Rome Beauty and Wagener.

Of the older trees in this orchard, the following varieties produced as follows:—

Grimes' Golden.—7 boxes No. 1. 2 boxes No. 2.

Ontario.—8 boxes No. 1. 1 box No. 2.

Salome.—3 boxes No. 1. 2 boxes No. 2.

Aiken.—2 boxes No. 1. ½ box No. 2.

Mother.—7 boxes of fine fruit, but almost every apple punctured by crows.

Jonathan.—4 boxes No. 1. 1 box No. 2.

Sutton Beauty.—6 boxes, nearly all No. 1, but almost all damaged by crows.

King.—This variety produced a fair crop of very fine apples, a large percentage of which were injured by crows. Yield, 7 boxes No. 1; 2 boxes No. 2.

Monmouth Pippin.—4 boxes No. 1, 1 box No. 2.

Winter Banana.—This variety began to bear this year and produced 2 boxes of fruit, 1½ of No. 1 and one-half box of No. 2.

Cox's Orange Pippin.—This variety produced a few apples, ten lbs. of No. 1 and 17 lbs. of No. 2.

COMMERCIAL PEAR ORCHARD.

No addition was made to the pear orchard this year. The following varieties fruited and are given in the order of ripening.

Dr. Jules Guyot.—Produced 43 lbs. of fine, even pears, all No. 1.

Bartlett.—Produced 17 lbs. of fine even pears, all No. 1.

Clairgeau.—Produced 15 lbs. fine No. 1 fruit.

Howell.—Produced 23 lbs. of rather irregular, uneven fruit; 18 lbs. No. 1, 5 lbs. small.

The older pear trees in the experimental orchard gave a very poor crop, and the fruit was not first-class.

COMMERCIAL PLUM ORCHARD.

No addition of new varieties was made this year. Nearly every tree has made a vigorous growth, but none of them bore fruit. Several of the trees bore a few blossoms, but no fruit set.

In the experimental orchard, a number of the trees died, owing, I think, to the very wet condition of the land in the previous winter, when the ground froze. The trees that lived blossomed, but nearly all the bloom fell off. Many of the trees that lived were in an enfeebled condition and made but little growth.

PEACHES AND APRICOTS.

The few trees left of these bore no fruit, although a few of the peach trees blossomed.

MEDLARS.

No vicissitude of climate affects the trees of this fruit and they bore a full crop as usual.

ORCHARD No. 4.

No additions have been made to this orchard this year. One tree died and two others had to be cut back on account of the tops dying, but these have recovered and all have made strong growth. Some varieties promise to produce fruit this coming summer.

As nearly all of these varieties were planted in the first orchard in the spring of 1890, when the land had just been cleared, it may be that some of them will do better on old land and may be considered worthy of a trial in the commercial orchard.

CHERRIES.

The sweet cherries bore no fruit this year, and the crop of sour cherries was very small. Several of the trees have died since leafing-out in spring.

MULBERRIES.

The mulberry trees bore a small crop of fruit, which the birds appreciated.

MOUNTAIN ORCHARDS.

Owing to scarcity of labour, very little attention has been given these orchards for a number of years. A forest fire ran over the highest one last spring and a large number of the trees were destroyed. Those left, as well as those in the orchards lower down the mountain, fruited again this year, but as in former years, the fruit was eaten by bears.

The soil on the benches is a very fine loam, suitable for fruit trees, and, owing to free circulation of air, the fruit grown on these hillsides is finer than that of the same varieties in the bottom lands.

SMALL FRUITS.

CURRANTS.

The currant crop was very light and the quality poor, as the berries were small. The frosts in spring, when the bushes were coming out in blossom and leaf, were severe, and the fruit did not set well or grow freely. Many of the bushes lost their foliage in summer.

BLACKBERRIES.

The only blackberry bushes which survived the severe winter of 1908-9, were the Eldorado, Snyder, Stone's Hardy and Maxwell. These bore a fair crop of firm berries and look promising for the coming summer.

RASPBERRIES.

Our new plantation of raspberries was too young to bear a crop this year. The following varieties each bore a few berries:—Cuthbert, Sarah, French Vice-President, and Pauline.

SAMPLES DISTRIBUTED.

Oats	140
Barley	68
Peas	132
Potatoes	454
Scions and cuttings	348
Nuts, tree seeds, etc.	314

CORRESPONDENCE.

Letters received	4,983
Letters despatched	4,869

METEOROLOGICAL RECORDS.

Months.	Highest Temperature.		Lowest Temperature.		Total Precipitation.	Bright Sunshine.	
1910.	Day.	°	Day.	°	Inches.	Hours.	Min.
April	23	85	28	30	3·02	113	36
May	31	84	9	36	4·93	143	12
June	10	91	3	43	5·51	136	18
July	10	94	28	44	2·16	258	06
August	9	82	23	41	3·9	158	48
September	12	84	25	40	3·47	148	48
October	19	69	26	30	7·1	69	36
November	7	62	6 & 13	30	7·61	38	12
December	9	55	9	26	6·7	32	24
1911.							
January	5	48	11	-3	4·98	11	36
February	28	53	2	16	3·56	84	42
March	24	65	8-11-22	29	2·76	142	36
Total precipitation for year ending March 31, 1911					55·70	1,337	54

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE,

Superintendent.

INDEX